A Dissertation on

A PROSPECTIVE CLINICAL STUDY OF TEMPORAL MANUAL SMALL INCISION CATARACT SURGERY

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CERTIFICATE

This is to certify that the dissertation entitled "A PROSPECTIVE CLINICAL STUDY OF TEMPORAL MANUAL SMALL INCISION CATARACT SURGERY "is a bonafide research work done by Dr. Vinodhini. K. in partial fulfilment of the requirement for the degree of Master of Surgery in Ophthalmology.

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DECLARATION

I hereby declare that this dissertation entitled "**A PROSPECTIVE CLINICAL STUDY OF TEMPORAL MANUAL SMALL INCISION CATARACT SURGERY** "is a bonafide and genuine research work carried out by me under the guidance of **Prof. Dr. A. RAJENDRA PRASAD** M.S.,(ophthal),D.O.,HOD & Professor, Department of Ophthalmology, Coimbatore Medical College & Hospital, Coimbatore.

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A PROSPECTIVE CLINICAL STUDY OF TEMPORAL MANUAL SMALL INCISION CATARACT SURGERY

CONTENTS

ABBREVIATIONS

SMC	–	senile mature cataract
SIMC	–	senile immature cataract
V/A	–	visual acuity
UCVA	–	uncorrected visual acuity
BCVA	–	best corrected visual acuity
WHO	–	World Health Organisation
POD	–	post operative day
SICS	–	small incision cataract
MSICS	–	manual small incision cataract
ECCE	–	Extracapsular cataract extraction
UV-B	–	ultraviolet B radiation
US	–	United States
NPCB	–	National Program for Control of Blindness
IOL	-	Intraocular lens
ACIOL	–	Anterior chamber intraocular lens

PCIOL – Posterior chamber intraocular lens

ICCE – Intracapsular cataract extraction

CCC – Continuous curvilinear capsulorhexis

PMMA – poly methyl methacrylate

AC – anterior chamber

ACM – anterior chamber maintainer

INTRODUCTION

Blindness is a major public health problem[1]. It is a devastating physical condition with deep emotional and economic implications[1]. A blind person loses his or her independence and is prone to experience a sense of profound loss and depression arising from being plunged into darkness[1]. The family directly shares the economic burden and indirectly so does the community[1]. Blindness is also associated with lower life expectancy[1].

Cataract is responsible for 50% of blindness in the world; the overall prevalence rate varies from 1 to 4% of the population[1]. Cataract prevalence increases with age[2]. As the world's population ages, cataract-induced visual dysfunction and blindness is on increase[2].Cataract is a significant global problem of 21st century[2].

The challenges are to prevent or delay cataract formation, and cure that which does occur[2]. Cataract occurs early in developing countries compared to developed countries[1]. Multiple factors like increasing age, genetic and environmental factors contribute to cataract formation[2]. In addition to these factors diabetes, exposure to oral and topical corticosteroids, malnutrition and dehydrational states contribute to the earlier development of cataract[1].

The increasing age is an important risk factor and prevalence doubles with each decade of age after 40years according to a data from Australia[2]. The age-adjusted prevalence of cataract in India was three times that of the US, with 22% of Indians of 75-83 years old having visually significant cataract, compared to 46% of those aged 75-85years in the US[8]. In India cataract occurs nearly 14years earlier than in a comparable study in US[2]. This adds to the existing backlog of cataract cases due to exponential population growth and insufficient health-care resources[2].

Environmental risk factors can be altered by reducing ocular exposure to UV-B radiation and stopping smoking[2]. In India the high incident light and populations dependent on outdoor agrarian activities vastly limits the success of these interventions[2].

Cataract progresses faster in diabetic patients, more so in diabetic women than in men[5]. People with diabetes have an increased risk of cortical and subcapsular cataract and are also more likely to have early cataract surgery[2]. These associations will assume greater importance as diabetes continues to increase in both developing and industrialized areas[2]. The challenge is to design and deliver widespread public health initiatives aimed at dietary and physical activity education and behaviour change to control this epidemic of diabetes[2].

The current 20 million people with severely reduced vision of 3/60 or worse due to cataract will have swelled to 40 million by the year 2020[2]. The benefits of cataract prevention are obvious, but unfortunately, the likelihood of achieving it is remote[2].

The cure for cataract is surgery, and is one of the most cost-effective of all health interventions[2]. But this is not equally available to all, and the available surgery does not produce equal visual outcomes[2]. The need of hour is comprehensive strategy including preventive measures to avoid risk factors combined with widespread surgical services capable of delivering good vision rehabilitation[2].

India has the distinction of being the first country in the world to launch a nationwide National Programme for Control of Blindness quarter of a century ago[30]. Cataract surgeries are performed under NPCB[30].

Vision 2020 is a global initiative launched by the World Health Organization in 1999[1]. It is based on the concept that every living person has a right to sight and aims to eliminate avoidable blindness worldwide by the year 2020[1].The Vision 2020 programme was adopted by the Government of India as a priority area for health development[1]. Cataract is one of the five areas focussed in the programme[1].

The surgical services need to be accessible, affordable and effective of good vision rehabilitation[2]. The goals of modern cataract surgery include restoration of vision as completely and as rapidly as possible while minimizing complications[28]. At the same time, the post operative refractive errors should be neglible[28].

Phacoemulsification is now the standard technique as it offers early visual rehabilitation and better un-aided visual acuity than the conventional sutured extracapsular cataract extraction [31, 15]. However, the high expenses of instrumentation and requirement of advanced training have limited the role of phacoemulsification in our country[16, 17].

Manual sutureless small incision cataract surgery has emerged as a cost effective alternative to phacoemulsification in the developing world[16]. SICS has the advantage of a self-sealing Sutureless incision with least surgically induced astigmatism at a low cost[15]. It is a safe, simple, consistent, stable, and cost-effective way of cataract removal[6].

The technique of small incision cataract extraction has various modifications and names[31]. Nonphaco Sutureless cataract extraction, Mini-Nuc technique, Manual phaco small incision surgery is some of the names given. Modifications involve the site, size and type of incision and method of nucleus delivery. One such modification is temporal small incision cataract surgery.

Every modification has its own set of advantages and limitations but the outcome of cataract surgery depends on the selection of appropriate technique. Each technique is selected according to the case encountered, the setting, as well as the surgeon's skill and comfort level.

Present study is done to evaluate the efficacy and safety of temporal manual small incision cataract surgery.

EVOLUTION OF CATARACT SURGERY

The written history of cataract surgery spans around 20 centuries[3]. The term "cataract" was introduced by Constantinus Africanus (AD 1018). He translated the Arabic "suffusion" into Latin "cataracta" meaning "something poured underneath something" the "waterfall"[3].

For more than 20 centuries, couching was the primary method for dislodging the cataract away from pupil[3]. The written description came from our own Indian surgeon Susruta (600 BC) [3]. He used two instruments – a sharp lancet to penetrate the sclera around 4mm temporal to limbus and a blunt needle passed through the conjunctiva behind the iris to dislodge the lens. The temporal approach was used as couching was performed in sitting posture and surgeon facing the patient[3]. The surgeon had to be ambidextrous[3].

Jacques Daviel, the father of modern cataract surgery introduced the incisional extraction of the cataract in 1753[3]. He described a planned extracapsular cataract extraction and he placed the incision in inferior limbus as patient was operated in seated position[3].

The two milestones that occurred in-between 1753 to 1862 changed the outcome of cataract surgery dramatically. They are[3]

1. Pierre-Francois-Benzet Parnard shifted the incision site to upper part of eye and the patient was operated in supine position.
2. Carl Himly introduced pharmacological mydriasis.

The focus of cataract surgeons shifted towards intracapsular cataract extraction as removing the lens in toto was considered to be safe[3]. Many eminent surgeons like Albert Von Grafe (1867), Christiane (1845), A.Terson (1871) and G. Reuling contributed to this[3].

Boston's Henry Williams introduced suturing of the cataract surgery wound in 1867[3]. Colonel Henry Smith refined the intracapsular cataract surgery by employing Indian-Smith manoeuvre, a sliding method to tumble the lens into anterior chamber in 1926[3].

Lens extraction methods changed with the introduction of various forceps like Veerhoff forceps, Kalt smooth forceps and Arruga's capsular forceps[3]. Ignacio Barraquer (1917) performed phacoerysis with pneumatic forceps[3].

The next breakthrough came by chemical zonulolysis with alpha chymotrypsin by Jose Barraquer in 1958[3]. Cryoextraction significantly improved the outcome of intracapsular surgery which

was introduced by T. Krawawicz and refined by other surgeons like Richard Brubaker and David Worhten[3].

Harold Ridley introduced artificial lens IOL implantation in 1949[3]. Between 1965 and 1972, Cornelius Binkhorst modified the IOL concept. He refined ECCE and used a IOL with two or four loops for support[3]. In 1977 Worst devised the "Worst Medallion" IOL, required suture fixation to iris and two loops through pupil resting on posterior capsule. This model was used in ICCE cases[3]. Modern PCIOL was devised by S P Shearing with J loops.

The era of intracapsular cataract extraction came to an end with the introduction of intra ocular lens implantation. The need for safe scaffolding for IOL shifted the focus towards extracapsular cataract extraction. The other additional influencing factors are the quest for small incisional cataract wound and lesser post operative complications. Coonan et al and Wetzig et al showed reduction of cystoid macular edema and retinal detachment by keeping posterior capsular intact[3].

The evolution of IOL is also similar to that of cataract surgery. It can be categorised into VII generations and started from 1949[5]. Ridley's

PC IOL constituted the first generation but gave way to ACIOL and iris fixating IOLs. But PCIOL again captured the centre stage[5]. PCIOL forms the VII generation of IOL with refinement like multifocal, accommodative capacity[5].

ECCE method was refined by many pioneers. William Simcoe introduced the 23-gauge irrigating cannula with suction by syringe. He popularised the 'grasp' method of nucleus delivery. McIntyre and James Gill are the pioneers of ECCE movement. The introduction of the anterior chamber maintaining viscoelastic gel, hyaluronic acid contributed to safer and more highly successful surgery[3].

Charles Kelman (1967) introduced Phacoemulsification of the cataract through a small wound[3]. But initially the procedure failed to catch on due to high rate of complications like corneal edema, vitreous loss and technical difficulty[3]. The final flaw was in the lack of ideal IOL which was corrected in the coming years[1]. The innovative idea of new capsulotomy like capsulorrhexis advanced the safety of phacoemulsification. The resurgence of phacoemulsification was facilitated by the nucleus manipulation techniques and the foldable implants[3].

Smaller phacoemulsification probes and foldable implants allowed the surgeons quest for astigmatically neutral surgical wounds. Girard was the first to name and describe the scleral tunnel[3].

An innovative technique was developed by surgeons to retain the advantages of phacoemulsification with the need to invest in equipments. They replaced the mechanics of phaco machine by modifying the incision architecture and nucleus manipulation. This technique is described by various terms like manual small incision surgery, Nonphaco small incision surgery. The cost of the surgery is reduced significantly by manual methods and use of 6.5mm PMMA lens.

REVIEW OF LITERATURE

MANUAL SMALL INCISION CATARACT SURGERY

MSICS is an alternative surgical technique that developed after phacoemulsification. It is a safe, simple, consistent, stable, and cost-effective way of cataract removal[6]. In this technique the whole nucleus, or the nucleus divided in parts, is removed through a self-sealing sutureless tunnel incision[42].

In our country due to the earlier occurrence of cataract and the delay in seeking treatment, mature and hypermature lenses account for a significant proportion of cataract cases[16]. We come across dense brown and black cataracts associated with Pseudo exfoliation and subluxation, where manual small incision surgery will be a better option[18]. Even in the most experienced hands and in the best operative settings, phacoemulsification is difficult and prone to complications in eyes with mature white cataracts[16]. Therefore it is prudent to consider manual small incision cataract surgery that may be safer and as efficacious[16].

METHODS

Classic Blumenthal technique uses the ACM (Anterior chamber maintainer) to allow all steps to be performed under positive irrigation pressure[61]. It is modified later and is highly effective and reproducible for all grades of cataract[36].

The Ruit technique is well-known modification of MSICS, used in developing countries[36]. This technique uses temporal scleral tunnel straight incision of 6.5 – 7mm incision[61].

VARIATIONS IN INCISION

Wound construction plays a major role in MSICS and has to be carefully planned depending on the technique and type of cataract and the amount of astigmatism[6]. By changing the configuration self sealing nature is imparted to the wound. This prevented the suture related complication. The most common cause of post operative visual impairment is astigmatism[14]. The astigmatic neutral wound became the goal of incision modification.

Kratz (1980) introduced posterior scleral incision to improve wound healing and reduce surgically induced astigmatism[68].

Girard and Hoffman (1984) coined the word scleral tunnel incision [68].

Singer (1991) described frown incision to reduce surgically induced astigmatism[61].

Gokhale and Sawhney (2005) studied induced astigmatism with three scleral incision locations. Their study found induced astigmatism was lower in the temporal and Superotemporal groups than in the superior group[14].

Lam (2009) modified the incision into large temporal scleral tunnel with scleral pocket incision with frown configuration.

OPTIMUM INCISION ARCHITECTURE

The incision can be straight, smile shaped, chevron and frown shaped[6]. The scleral tunnel incision has three dimensions.

1. The thickness of flap is one third to half the thickness of sclera.
2. The width is the distance from the scleral groove to the point of entry into the anterior chamber. If it is equal to the length it forms a square wound and least astigmatism inducing[6].
3. The length is the distance between the ends of the incision.

MANAGEMENT OF NUCLEUS

ANTERIOR CAPSULOTOMY

The MSICS techniques have the nucleus prolapsed into the anterior chamber as a common step[47]. The nucleus may be rotated into anterior chamber or picked by a 26-gauge cystitome. The technique of nucleus prolapse depends on the type of capsulotomy[58].

Following a Can-opener capsulotomy, the nucleus is prolapsed mechanically without hydroprocedures[58]. A 26-gauge needle or cystitome is used to perform anterior capsulotomy[47]. The Sinskey hook or the lens dialer is used to lift the superior pole of nucleus and prolapse over the iris. Then it is rotated in a clockwise or in an anti-clockwise so that the whole nucleus is out. But the advantage of in-bag IOL is lost in Can-opener capsulotomy[58].

Continuous curvilinear capsulorhexis (CCC) developed by Gimble and Neuhan allows MSICS to retain the advantages in-bag IOL fixation[74, 58]. The intact rim prevents extension of anterior capsular tear into posterior capsule and provides better centration of IOL[74, 25]. The elastic margins of the rim allow the safe expression of nucleus[58]. The right size of CCC is very crucial for the nucleus prolapse and it is safe to have more than

5mm[58]. Trypan blue staining of the anterior capsule helps in getting an optimum size CCC in mature and hypermature cataract cases[49].

HYDROPROCEDURES

These procedures are manipulations of the nucleus inside the bag[58]. Mastering these techniques allows the surgeon to prolapse the nucleus without altering the pupil size and utilizes single instrument. This reduces instrumentation and surgical time. These techniques are not safe in eyes with very hard cataract or weak zonular support[58].

Hydrodissection was introduced by Faust and modified by Fine[74]. This procedure separates the nucleus from the cortex and the capsule. The fluid is injected under the lens capsule which cleaves the cortex from posterior capsule and mobilizes the nucleus.

Hydrodelineation introduced by Anis separates the outer epinucleus shell from the inner compact endonucleus[74]. In this fluid is irrigated forcefully into the nuclear mass giving rise to 'golden ring' sign. This reduces the size of nucleus significantly so that nucleus extraction through the tunnel incision becomes feasible[58].

VARIATION IN NUCLEUS DELIVERY

The extraction of nucleus is the hardest and most critical part of the surgery[43]. There are various methods to deliver the nucleus out.

Sandwich technique: the anterior chamber is filled with viscoelastic material and the nucleus is extracted by sandwiching it between the irrigating vectis and iris spatula[61, 47].

Fish hook technique: this technique was developed by Lahan (1997)[42].The nucleus is delivered by using a bent 30-gauge needle tip or an irrigating vectis[47].

ACM and Sheets glide: this technique is used in Blumenthal MSICS. The lens glide is placed under the nucleus and gentle pressure on the sclera is applied. This opens the wound and pushes the nucleus through the tunnel by the hydrostatic pressure provided by the anterior chamber maintainer[36, 61].

Sinskey hook method: two Sinskey hooks are introduced through two separate paracentesis. Left hand hook is slipped under the CCC and elevates the superior pole toward the incision. The right hand hook is placed beneath the elevated pole prevent the nucleus from falling back into the bag[61].

Viscoexpression: a curved cannula is then insinuated under the nucleus and the viscoelastic injected beyond the inferior margin of the nucleus. While injecting the viscoelastic material, the posterior lip of the tunnel is

gently depressed with the same cannula. This allows the tunnel to open up and allow the nucleus to be expressed out slowly[26].

Irrigating cannula method: Ruit technique of MSICS utilizes this method. An irrigating Simcoe cannula that was designed with a 26-gauge infusion and a corrugated concave edge was used. It is used to hydro dissect, loosen and float the nucleus into the mouth of the tunnel and the nucleus is expressed out[64].

Manual phaco fracture: the scleral tunnel is made large enough to lodge the nucleus by using the 'chevron' frown incision. The lodged nucleus is manually fragmented and removed through the incision. The endothelial damage is prevented by breaking the nucleus in the tunnel and astigmatism is reduced by using 'chevron' frown incision[61].

Nucleus bisection and trisection: the nucleus is divided into two by using one instrument as the cutter and vectis as the board[47]. The nucleus trisection method described by Kansas and Sax splits the nucleus into three fragments manually using Kansas trisector and vectis. The resulting small fragments are viscoexpressed through the small incision[61]. The frequent complication is transient corneal edema due to the manipulation in the anterior chamber[61].

Snare technique: a wire loop stainless steel snare is used to snare the nucleus into fragments and expressed through the incision. It is a single instrument with two cannulas with the wire loop in the tip of the first cannula. The wire loop is lassoed around the nucleus and divides into two pieces by constricting[47, 61].

VISUAL OUTCOME OF MANUAL SMALL INCISION CATARACT SURGERY

The outcome of cataract surgery depends on many factors like preoperative ocular status, quality of surgery, and the postoperative correction of refractive error[51]. Good patient selection is an important determining factor of final visual outcome[51]. Pre-operative evaluation of the patient allows the surgeon to select the appropriate technique in individual case basis.

The WHO defines visual impairment as vision less than 3/60[64].The impact of cataract surgical services are assessed by number of blind persons (visual acuity <3/60) who regained vision after cataract surgery[51].The quality of cataract services is assessed by the postoperative vision [51].

The WHO categorises the outcome of cataract surgery in three groups: good, borderline and poor. It recommends aiming for a 'good',

uncorrected visual acuity in at least 80% of surgeries, and 'poor' outcome in less than 5%[42].

TABLE 1: WHO GUIDELINES AND RECOMMENDATIONS FOR THE POST-OPERATIVE OUTCOME OF CATARACT SURGERY WITH IOL[42]

GRADE	V/A	UCVA	BCVA
GOOD	6/6-6/18	80%	90%+
BORDERLINE	<6/18-6/60	15%	<5%
POOR	<6/60	<5%	<5%

Various studies different parts of world have been published on the visual outcome of MSICS, comparing with ECCE and Phacoemulsification. They have proved that MSICS provides better result than ECCE and comparable results with Phacoemulsification.

Hennig A, et al[52] study reported an uncorrected good visual acuity (≥6/18) in 76.8% of cases at discharge, which declined to 70.5% at 6-weeks and 64.9% at 1-year follow-up. The best corrected good visual acuity (≥6/18) was found in 96.2% at 6-weeks and in 95.9% of cases at 1-year. Poor visual outcome (<6/60) occurred in less than 2% cases.

Khan M T, et al[15] study reported an un-corrected good visual acuity (≥6/18) in 64% of cases at discharge and in 66.3% of cases at 6-weeks. The best corrected good visual acuity (≥6/18) in 80.6% of cases at 6-weeks follow-up.

Zaman M, et al[46] study reported an uncorrected good visual acuity (≥6/18) in 62.51% of cases at 1st post-operative day and in 93.40% of cases at 6-weeks follow-up.

Venkatesh R, et al[76] study reported uncorrected good visual acuity (≥6/18) in 78.4% of cases and best corrected good visual acuity (≥6/18) in 97.1% of cases on 40th post-operative day.

MSICS Versus ECCE

Gogate P M, et al[17] is a randomized controlled study compared the efficacy of manual small incision cataract surgery with conventional ECCE. At 6-weeks follow-up in MSICS group 47.9% of cases had an uncorrected visual good acuity (≥6/18) compared to 37.3% of cases in ECCE group. Best corrected visual acuity in MSICS group was good (≥6/18) in 89.8% of cases compared to 86.7% in ECCE group.1.1% of cases in ECCE group and 1.7% of cases in MSICS group had poor(<6/60). In spite of requiring similar equipments to ECCE gives better uncorrected visual acuity.

In a Cochrane review[54, 55, and 56] of surgical interventions for age related cataract Meta -analysis of two studies, Pune Study and George 2005 was done to compare MSICS with ECCE. These studies have shown a significantly better uncorrected visual acuity (≥6/18) and surgically induced astigmatism in the MSICS group (47.9%) versus ECCE group (37.3%), but no difference in BSCVA between the two groups.

Venkatesh R, et al[49] study reported an uncorrected good visual acuity (≥6/18) in 87.9% of cases. This study evaluated the efficacy of MSICS in phacolytic glaucoma cases. The significance of this report lies in the fact that phacolytic glaucoma is not an uncommon presentation in a developing country like India[49].

MSICS Versus PHACOEMULSIFICATION

Ruit S, et al[64] study reported an uncorrected good visual acuity (≥6/18) in 89% of cases in MSICS group and in 85% of cases in the phaco group at six months follow-up. The best corrected good visual acuity (≥6/18) was reported in 98% of cases in both the MSICS and the phaco group. The two groups showed no statistically significant difference in UCVA or BCVA at 6-months follow-up.

Venkatesh R, et al[16] study reported an uncorrected good visual acuity (≥6/18) in 82.0% of cases in MSICS group and in 87.6% of cases in the phacoemulsification group at 6 weeks follow-up.

Singh S K, et al[40] study compared the uncorrected visual acuity between MSICS and phacoemulsification on the first post-operative day. The study showed an uncorrected good visual acuity (≥6/18) in 77.7% of cases in MSICS group and in 68% of cases in the phaco group.

Better vision on first post-operative day with MSICS can be correlated with the greater increase in corneal thickness in the phacoemulsification[64]. There is no statistically significant difference between visual outcomes at 6 weeks follow-up[16, 64].

In a Cochrane review[54, 55, and 56] of surgical interventions for age related cataract Meta -analysis of the two studies Gogate 2005 and George 2005 was done. This study reported that that the phaco group has a significantly improved proportion of patients with an uncorrected good visual acuity (≥6/18) in 81.1% of cases compared to MSICS group. But there was no difference in the BSVA.

SURGICAL-INDUCED ASTIGMATISM

Astigmatism means "without a point". Miller Stephen J defined astigmatism as a condition of refraction in which a point of light cannot be made to produce image upon the retina by a correcting spherical lens[1]

Any ocular surgery with incisions placed on cornea and sclera will induce astigmatism by altering the curvature of the refracting surface[32]. The astigmatism induced by the surgical manoeuvring and the wound healing is called surgically induced astigmatism. It is a major cause of functional disturbance and insufficient uncorrected visual acuity[20, 31].

Calculating the surgically induced refractive change is important in evaluating the outcome of small incisions and various wound closures for cataract surgery[4].

The calculation and analysis of various techniques help to determine the optimal wound size for a cataract surgery[4].

With the advent of PCIOL, microsurgical instruments and microscope the goal of cataract surgery has become the best and earliest possible visual rehabilitation. Here the best possible vision means best uncorrected visual acuity[19]. The biggest hurdle in this quest is the astigmatic component of the refractive error following surgery[19, 51].

Incision location, length, configuration, closure technique, and pre-existing astigmatism are some of factors that determine the post-operative astigmatic error[19, 18].

FACTORS RELATING TO INCISION

Self sealing scleral tunnel incisions are less likely to induce astigmatism because of their posterior (external end) location, anterior corneal (internal flap) location and the 'blocking effect' of the limbus on corneal astigmatism induction[19]. The incidence of SIA is more in corneal incisions because of their anterior location[15].

The cataract wound tends to flatten the corneal meridian along which the wound is centered[6]. The degree of flattening varies with the site, length and is predictable to some degree[7]. Thus postoperative astigmatism can be controlled by manipulating the site and size[7].

Akura J, et al(2000) study evaluated the results of modifications of large self-sealing incisions in minimizing the SIA[7]. The BENT (between nine and twelve-o clock position) frown incision achieved the astigmatic neutrality and incisions in steeper axis reduced SIA in all cases[7].

Merriam J C, et al (2001) study compared the change in corneal meridians after different incisions. The study concluded that the

magnitude and duration of change depend on both length and location of the incision[33].

Gokhale N S, et al (2005) study evaluated the reduction in astigmatism in MSICS through change in incision site. The SIA was found to be lower in temporal and super-temporal group compared to superior group[14].

Siddique M, et al (2009) study compared the SIA between different incision sites. The study found that minimum and safe astigmatism is achieved in temporal approach[50].

Venkatesh R, et al (2009) study compared SIA of superior approach with temporal approach. The study reported 1.08 D in superior and 0.72 D in temporal group[76].

Pawar V S, et al (2012) study compared postoperative astigmatism in different location and same sizes were compared[32]. The SIA of temporal and supero-temporal group was found to be the least[32].

Malik V K, et al (2012) study compared the astigmatism in MSICS with superior and temporal approach. The temporal approach had the lesser SIA than that of superior[65].

Buzard K A, et al (1991) study found no statistically significant difference in the induced astigmatism between the horizontal suture group and the no-suture group[19].

Phacoemulsification is considered superior to manual small incision cataract surgery due to the smaller incision size and in amount of induced astigmatism[17].This disadvantage can be minimized by altering the location and configuration as shown in various studies.

The difference in the amount of astigmatism when comparing the different techniques is relevant in populations that have limited access to spectacles[54, 55, and 56]

In a Cochrane review[54, 55, and 56] of surgical interventions for age related cataract Meta -analysis of two studies, Pune Study and George 2005 was done to compare MSICS with ECCE. The SIA was found to be lower in MSICS compared to ECCE due to Sutureless wound.

In a Cochrane review[54, 55, and 56] of surgical interventions for age related cataract Meta -analysis of the two studies Gogate 2005 and George 2005 was done to compare MSICS with phacoemulsification. Even though there was no difference in the average SIA between MSICS and PHACO, significantly less number of patients had <1 D astigmatism in PHACO group.

Many studies conclude that although phacoemulsification reduces astigmatism better than MSICS at 6-weeks follow-up, there is no significant difference in the long term[61].

The astigmatism induced in MSICS can be used to neutralize the pre-existing astigmatism by changing the site of incision[18, 65]. But this method has a limited effect in astigmatic reduction- with a maximum reduction of around 1.00 to 1.50 diopters[7].

COMPLICATIONS

MSICS is more difficult than conventional ECCE. The preparation of optimum size scleral tunnel, handling of instruments, and removing of nucleus all require better skill and additional training[52]. The manoeuvring in the anterior chamber demands good dexterity and surgical skill[47]. Once the technique is mastered the surgery is faster and the complication rate is low[52].

The principles of a good MSICS surgery are proper construction of the scleral tunnel, minimal handling of tissues (cornea, iris), and preserving the posterior capsule[47].

The Oxford Cataract Treatment and Evaluation Team(OCTET) protocol categorizes the intra-operative and post-operative complications into three grades[17].

Grade I: Trivial complications that may have needed medical intervention, but were not likely to affect the visual outcome markedly.

Grade II: Intermediate complications are that needed medical intervention. They would have reduced the post-operative vision if left untreated.

Grade III: Serious complications are that would have needed immediate medical or surgical intervention. The interventions are a must to prevent gross visual loss.

INTRAOPERATIVE COMPLICATIONS

- Related to the wound

  Shallow tunnel - button holing

  Deep tunnel-premature entry, iris injury, and bleeding

  Iris prolapse –iris injury, chaffing

  Shallowing of AC due to efflux of fluid through the wound
- Sphincter tear due inadequate mydriasis
- Iridodialysis
- Descement membrane stripping and tears
- Striate keratopathy
- Capsulotomy related

  Too small – nucleus prolapse difficulty

  Too large – extension of anterior capsular tears

  Incomplete capsulorhexis

- Difficulty in nucleus prolapse –inadequate Hydroprocedures
- Nucleus delivery difficulty due to large and hard nucleus
- Zonular disruption with or without vitreous loss
- Corneal endothelial damage
- Posterior capsular rent with or without vitreous loss
- Incomplete cortical wash- residual cortex at 12-o clock
- Failure to implant due to poor PC support

A complete pre-operative evaluation of individual cases allows the surgeon to select the appropriate technique and plan the surgical steps in advance. This ensures a good surgery and spares the surgeon from unpleasant surprises on the table.

The management of intra-operative complication is made easier by earlier identification and prompt action. A properly constructed scleral tunnel incision prevents all the wound related complication[47].

Capsulorhexis of adequate size (>6mm) and Hydroprocedures will ensure uneventful nucleus prolapse. The staining of anterior capsule with Trypan blue helps in completing the capsulorhexis [49].

Inferior Iridodialysis is a unique complication of phaco sandwich technique. The resulting bleeding can be controlled by suturing[47].

POST-OPERATIVE COMPLICATIONS[17, 47]

- Striate keratopathy
- Descement membrane folds
- Transient corneal edema
- Shallow AC
- Wound leak
- Hyphaema
- Iritis
- Residual 12-o clock cortex
- Vitreous in AC touching or not touching the cornea
- Pupillary block glaucoma
- Pupillary capture
- Malposition of IOL
- Deposits on IOL
- Posterior capsule opacification
- Cystoid macular edema
- Endophthalmitis

If the proper wound integrity is not maintained, shallowing of AC is seen on first post-operative day. Whenever there is a doubt about the integrity of wound, it is better to suture[47]. Horizontal suturing does not alter the astigmatic neutrality of the tunnel[19].

The corneal edema is usually transient and clears off within one week. Excessive handling of iris will result in post-operative Iritis and cystoid macular edema[47].

Posterior capsular opacification can be prevented or delayed by good cortical wash and polishing the capsule[47].

MSICS is a safe surgery[13, 17, 47]. Various studies have shown that the complication rate of MSICS is lower than ECCE and comparable to phacoemulsification [13, 16, 40, 61, 62].

ADVANTAGES OF MANUAL SMALL INCISION CATARACT SURGERY IN INDIA

Blindness affects an estimated 12.5 million people in India, with cataract contributing to 50-80% of this[49]. As the incidence increases with age the cataract blindness burden will increase significantly due to greying of population[2]. The increasing backlog of cataract blindness is the greatest challenge in cataract surgery[48].

To tackle this challenge we need is an efficient, high volume system utilizing low cost, low technology procedure that can treat advanced cataracts with minimal complication in the shortest amount of time [42, 48, 61].

MSICS is considered as the most appropriate technique for performing high-volume cataract surgery due to its efficiency, safety, shorter surgical time and lower cost[61].

Cataract surgery is considered to the most cost effective medical intervention. Lansingh V C, et al (2007) determined the cost-effectiveness of cataract surgery worldwide[57]. Phacoemulsification was found to be costlier than either ECCE or MSICS. Since MSICS provides better uncorrected visual acuity with the same cost, it is considered to be the most appropriate procedure to tackle the backlog of cataract cases[61].

The shorter surgical time of MSICS enhances the productivity of the scarcest resource, the cataract surgeons[17, 40, 52, and 64].

TEMPORAL MANUAL SMALL INCISION CATARACT SURGERY

Temporal SICS is a type of manual small incision cataract surgery done through temporal approach.

Cataract surgery is constantly evolving[46]. Cataract surgery has come a long way from susrutha's couching to phacoemulsification[74]. The temporal approach was used in couching since it provided the better access to the patient and the sitting arrangement of the surgeon in front of the patient [74]. The surgeon had to be ambidextrous to operate in both eyes[21].The site of incision shifted to superior when surgery was done with the patient in supine position[74].

With the invention of surgical microscope and intraocular lenses, modern cataract surgery evolved into a refractive surgical procedure capable of improving the best uncorrected vision[19].

In the quest to achieve best possible post-operative vision, the cataract surgeons improvised the technique by various modifications. One such modification of MSICS is the temporal SICS.

ADVANTAGES OF TEMPORAL APPROACH

VISUAL OUTCOME

Temporal incision is further away from the visual axis of the eye than the superior incision. Any resulting corneal edema in postoperative period will not affect the immediate visual rehabilitation. The wound construction is done easily in deep sockets and small eyes[32].Wound healing is better in temporal incisions due to the absence of distractive force of blinking[33].Gravity will not interfere with the wound healing and stability because the wound is parallel to the vector of forces[32, 33].

Temporal incisions induce less SIA than superior because of the lesser influence of lid and the extra ocular muscle[7].The mean induced astigmatism with temporal incisions is 0.75 D, whereas in superior incisions it is 1.75 D[75]. Typical human cornea is 1mm wider in horizontal meridian than the vertical meridian[75]. Thus the temporal incisions are placed slightly away than the superior incisions[33]. Temporal incisions cause less change in corneal curvature than comparable superior incisions[32]. So the SIA is less in temporal incisions[32]. Temporal small incision minimizes the senile against the rule astigmatism[31, 37, and 45] by flattening the steeper axis of the cornea.

COMPLICATIONS

The complication incidence is less in temporal manual small incision due to various factors. It provides better access to instruments and thus reduces the surgical time[36].It is safe in brown and hard cataracts due to its larger wound size. The larger size may induce more astigmatism, which is overcome by its placement away from cornea. The temporal manual small incision cataract surgery utilizes the similar steps in nuclear management as that of phacoemulsification. The trauma to corneal endothelial cells is minimal through temporal approach.

ADDITIONAL ADVANTAGES

The superior conjunctiva is left intact which can be used for trabeculectomy in future, if needed[32.]Temporal approach cataract surgery can be done on a eye with filtering bleb[32].Temporal approach can be used as a component in 2-site technique in combined surgery in treatment of patients with cataract and primary open angle glaucoma[9].

SURGICALLY INDUCED ASTIGMATISM

Even though it has been known that cataract incisions influence astigmatism for long time, only for past 15 years the attention has been given to the control measures of astigmatism [33, 77]. The modern cataract surgery evolved into the refractive cataract surgery, a procedure capable

of correcting both the spherical and astigmatic components of refraction[19].

Some degree of naturally occurring astigmatic error is said to be present in nearly 95% of eyes. The clinically significant astigmatism is reported to occur in 7.5% to 75% of eyes[77]. The postoperative astigmatism greater than 2 D occurs in 25 to 30% of eyes[77].

The goal of refract cataract surgery has become the correction of spherical component and eliminate the cylindrical component of refractive error simultaneously. This is achieved by utilising the biometry to predict the exact spherical component and by imparting the astigmatic control measures[19]. The astigmatic control measures includes the wound construction to attain least induced astigmatism and exploiting the astigmatism inducing property of incision to correct the pre-existing astigmatism[18].

The scleral tunnel incisions provide a good control over the induced astigmatism and faster wound stability[34]. The pre-existing astigmatism is neutralized by placing the incision along the steeper axis[18].

Senile cataract is most important cause of reversible blindness in India and against the rule astigmatism is more common in elderly [65]. Various studies have documented the increased prevalence of against the rule

astigmatism in the elderly population[37, 45]. The incision placement at the steeper axis, the horizontal axis neutralizes the pre-existing error[18].

Various studies have proved temporal scleral tunnels are less astigmatism inducing than the superior tunnels due the minor changes in keratometry, localised incision flattening, distance from the visual axis.

In patients with mature hard cataract and deep set eyes accessibility becomes a major problem where temporal SCIS will be better. In temporal SICS the superior conjunctiva is left undisturbed and can be utilized for trabeculectomy if need arises. This is advantageous in a case scenario where the patient has cataract surgery before developing glaucoma because cataract occurs earlier in our country.

Phacoemulsification is considered to be the gold standard of cataract surgery 100% phaco is neither practical nor feasible in our country. Even the experienced phaco surgeons had to be bailed out and conversion to MSICS gives better visual outcome than ECCE[70]. This conversion rate is reported to be 3.7%.

Thus Temporal SICS is not so much as an alternative to phacoemulsification and superior MSICS but is an additional technique in the armamentarium. All three techniques are complementary to each other[70].

CASE STUDIES

Many studies have proven the advantage and efficacy of small incision cataract surgery using temporal approach[61].

A prospective randomized clinical trial of phacoemulsification versus MSICS by Ruit S, Tabin G, Chang D, et al proved that MSICS by temporal approach gave equally excellent visual outcome as phacoemulsification. MSICS was significantly faster, less expensive and less technology dependent than phacoemulsification[64].

Singh V K, Winter I, Surin L, et al compared the safety and efficacy of SICS with temporal approach and phacoemulsification. The study concluded that SICS with rigid PMMA lens is a suitable technique to treat immature cataract in developing countries[40].

Kongsap P, et al compared Ruit technique was compared with the modified Blumenthal technique and concluded that both have equal visual outcomes, with low complication rates[36].

Junejo S A, et al concluded that the Nonphaco Sutureless cataract extraction through temporal approach ensures rapid visual recovery with minimum astigmatism against the rule[31].

Malik V K, et al concluded that SICS with temporal approach provides a better stabilization of the refraction with significantly less SIA compared to superior approach[65].

Siddique M, et al compared the visual outcome between superior and temporal approach in MSICS and concluded that both are safe and effective. Also the temporal approach provides better un-corrected visual acuity and least and safe astigmatism[50].

Zawar S V, Gogate P, studied the safety and efficacy of temporal manual small incision cataract surgery in India. The study concluded that temporal manual small incision cataract surgery gives excellent visual outcome with minimal astigmatism and low complication rate at economic cost.

Gokhale N S and Sawhney S study found that induced astigmatism was lower in temporal and supero-temporal groups compared to that in superior group[14].

Pawar V S and Sindal D K compared the post-operative astigmatism in small incision cataract surgeries with superior, super-temporal and temporal incisions. The clinical study concluded that SICS with temporal and super-temporal incisions provides better quality of vision due to a significantly less astigmatism[32].

AIM OF THE STUDY

The aim of the study is to

To evaluate visual outcome of Temporal Manual Small incision Cataract Surgery

To evaluate the intra-operative complications and their management.

To evaluate the post-operative complications and their management.

To assess the visual rehabilitation of the patients after cataract surgery

MATERIALS AND METHODS

STUDY DESIGN

A prospective hospital based study

SETTING

The study was conducted at the Department of Ophthalmology, Coimbatore Medical College Hospital.

DURATION OF STUDY

From October 2011 to September 2012

STUDY POPULATION

Adult patients in the age group between 45 to 70 years with senile cataract who have been operated in the department of ophthalmology

CASE SELECTION

The cases were selected those cases who were operated on two days a week, on the author's theatre day. The following inclusion and exclusion criteria were applied in case selection. Similarity between cases was maintained as far as possible.

INCLUSION CRITERIA

Adult patients, age group 35-75

Senile immature cataract

Senile hypermature cataract

Nuclear sclerosis 1-4

EXCLUSION CRITERIA

Cases that have not come for 6 weeks follow-up

Cases with pterygium

Cases with corneal pathology

Cases with very high astigmatism>2D

Cases with co-existing glaucoma

Cases with uveitis

Subluxated lens

Traumatic cataract

One eyed patients

Aphakia

STUDY DESIGN

Case selection is done using the above mentioned inclusion and exclusion criteria. Demographic details of the cases were recorded.

All the cases were evaluated using the routine preoperative evaluation protocol by the author. The protocol is as follows:

1. Visual acuity with pinhole
2. Intraocular pressure
3. Syringing of NLD
4. Ruling out of any foci of infection
5. Fundus examination (dilated pupil with IDO)
6. Slit lamp examination for nucleus grading
7. Keratometry
8. A Scan biometry
9. Blood pressure
10. Urine sample for sugar and albumin
11. Random blood sugar

All the selected cases were operated by a single surgeon, who is well versed in all types of small incision cataract surgeries (manual &phaco)

and in both approaches, superior and temporal. This is done to avoid the compounding effect of the surgeon factor.

All were operated under peribulbar anaesthesia using 3ml of 2% xylocaine with adrenalin 1:1000 dilution mixed with Bupivacaine. Two – needle technique was used.

PERIBULBAR ANAESTHESIA

The adjective peribulbar refers to that location external to confines of the four muscles and their intermuscular septa[8]. Local anaesthetic agents are deposited within the orbit but do not enter within the geometric confines of the cone of rectus muscles[8]. The intermuscular septum was incomplete and permitted anaesthetic solution to spread into the cone[8]. Of the many variations of technique a common one is two-needle technique. In this first injection is given in inferior-temporal and the second in superior nasal quadrant[8]. Up to 5ml of

Anaesthetic solution is given. Peribulbar block is safer than the traditional retrobulbar anaesthesia as it avoids injury to optic nerve and extracular muscles. Delayed onset of akinesia, requirement of greater volume of anaesthetic solution leading to increased ocular pressure, periorbital ecchymosis and conjunctival chemosis are the main complications of peribulbar block[8].

SURGICAL TECHNIQUE

The position of the surgeon and the assisting staff is important in temporal small incision cataract surgery. The surgeon was seated right side of operating table for right eye cases and the assisting staffs were placed at the head end. This positioning was changed accordingly in left eyes.

Since this rearrangement was time consuming, the cases were selected in such a way that one(R/L) sided cases were operated on one day.

Eyelid and surrounding area cleaned using povidone iodine solution and draped with eye towel. A wire speculum applied and conjunctival irriagation with povidone-iodine solution was completed.

Superior rectus bridle suture was not required, which saved time and prevented any untoward injury to the muscle sheath.

A limited peritomy and light wet field cautery done.

CONFIGURATION OF THE INCISION

A 6-7 mm external scleral straight incision, 2mm behind the limbus was created using an 11-blade. The depth of incision was ½ of scleral thickness.

The crescent blade was used to dissect the scleral lamellae and scleral tunnel was created. The tunnel was extended 2mm into the clear cornea. The internal opening of the sclerocorneal tunnel was made using 2.8 mm keratome knife in a downward angle. By this angulation three plane of the incision was maintained. A side port was created 90° away from the tunnel.

CAPSULORHEXIS - CCC

The anterior chamber was filled with viscoelastic (2% hydroxyl propyl methyl cellulose). The capsulorhexis of size more than 6mm was completed using the bent 27-gauge needle. The internal lip of tunnel was extended full length using blunt 3.2mm extending knife.

NUCLEUS PROLAPSE AND DELIVERY

Hydroprocedures were done and nucleus was prolapsed into the AC with the bent 27-gauge needle. The viscoelastic material was filled in the AC and the nucleus was extracted with the phaco-sandwich technique.

Phaco-sandwich is a two-instrument technique. The prolapsed nucleus is sandwiched between the vectis and iris spatula to deliver out. A complication peculiar to this technique is inferior Iridodialysis. Fortunately, no such complication occurred in this study population.

CORTICAL WASH AND IOL IMPLANTATION

A complete cortical wash was done using simcoe irrigation aspiration cannula. Viscoelastic material was injected into AC and the capsular bag was inflated.

The rigid 6.5mm PMMA IOL was implanted in the capsular bag. The visco elastic material was removed by irrigation and aspiration with Simcoe cannula.

WOUND CLOSURE

The wound was closed with inflating the AC with ringer lactate solution via the side port. The self-sealing nature of wound was checked at the end of procedure. No sutures were applied and conjunctiva was opposed with light cautery.

All the cases were given subconjunctival 0.5ml gentamycin and 0.5ml of dexamethasone. Sterile pad and bandage was applied.

The intra-operative complications and the duration of surgery were documented for all surgeries.

I POST-OPERATIVE DAY EVALUATION

1. Wound approximation
2. Visual acuity with pinhole

3. Slit-lamp examination - cornea, AC reaction, IOL position and complications if any.
4. Fundus examination

All the patients were treated with topical ciprofloxacin and dexamethasone eye drop every two hours on I post-op day.

The topical ciprofloxacin and dexamethasone eye drops six times per day were given to all the patients for one week.

I WEEK FOLLOW-UP

1. Wound integrity
2. Visual acuity with pinhole
3. Slit lamp examination –cornea, anterior segment reaction, IOL positioning, and complication if any.

The antibiotic steroid combination drug dose was tapered gradually to twice per day in six weeks. Corneal edema and fibrinous uveitis are treated medically.

6 WEEKS FOLLOW-UP

1. Visual acuity- best corrected vision
2. Refraction
3. Slit lamp examination – cornea, anterior segment reaction, IOL position and complications if any.

4. Keratometry
5. Fundus examination
6. IOP measurement

Refraction was done after dilating and retinoscopy done using plane mirror retinoscopy. Keratometry reading were recorded to calculate the astigmatic change caused by the surgery. Bausch & Lomb Keratometry and automated refractometry were used for recording the keratometry values.

KERATOMETRY[27]

Keratometry is the optical method of determining the curvature of the central cornea. Usually it is expressed as dioptric power (D) or as dioptric curvature (Kd) of the cornea. The steepest and flattest curvatures act as the principal meridians and the dioptric values associated with them are called K readings.

Normally the K readings of the principal meridians are nearly of same magnitude, 43D on average and usually within ±0.5D of one another. The difference in K reading is defined as corneal astigmatism. The differences more than 0.5D tend to indicate a significant amount of astigmatism, which can diminish the visual performance.

Typically, there are three forms of regular astigmatism namely with- the-rule, against-the-rule, and oblique astigmatism. The with-the-rule is most common and against-the-rule is less common (except in older adults). The oblique astigmatism is the least common.

The irregular astigmatism cannot be assessed perfectly with keratometry alone, because of the distortion of the mire circle. The cases with irregular astigmatism were ruled out during the case selection in the present study.

A-SCAN BIOMETRY

It consists of entering K reading with ultrasonic measurement of axial length. IOL power was calculated using SRK II formula.

METHODS OF STATISTICAL ANALYSIS

The tests used for analysis of this study are the t test and chi-square test. The p value is calculated and less than .05 has been taken as significant.

Descriptive statistical analysis of this study was done. The measurements are expressed in number as frequency and percentage.

The relationship between independent variables was analysed by chi-square test. The ‘p’ value less than .05 was taken as significant.

RESULTS AND OBSERVATIONS

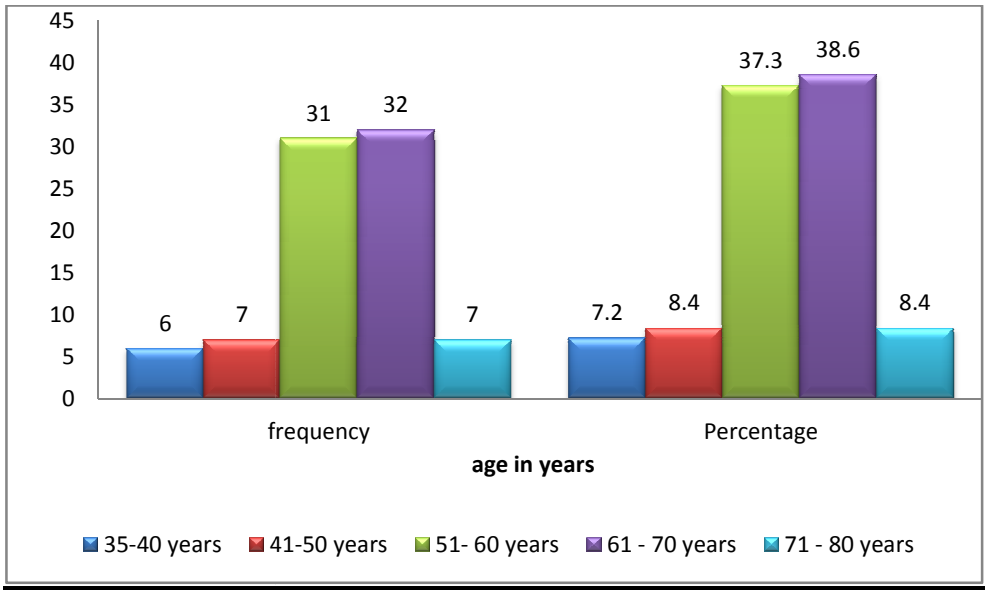
The study entitled "A Prospective Clinical Study of Temporal Manual small incision surgery" comprises of total 83 cases.

The age of the cases varies in range of 40 to 80 years. The majority (61%) of cases were in the age group 50 to 70 years.

TAB – 2 : AGE GROUP

AGE	FREQUENCY	PERCENTAGE
35- 40 YRS	6	7.2
41-50YRS	7	8.4
51-60YRS	31	37.3
61-70YRS	32	38.6
71-80 YRS	7	8.4
TOTAL	83	100

FIGURE-1

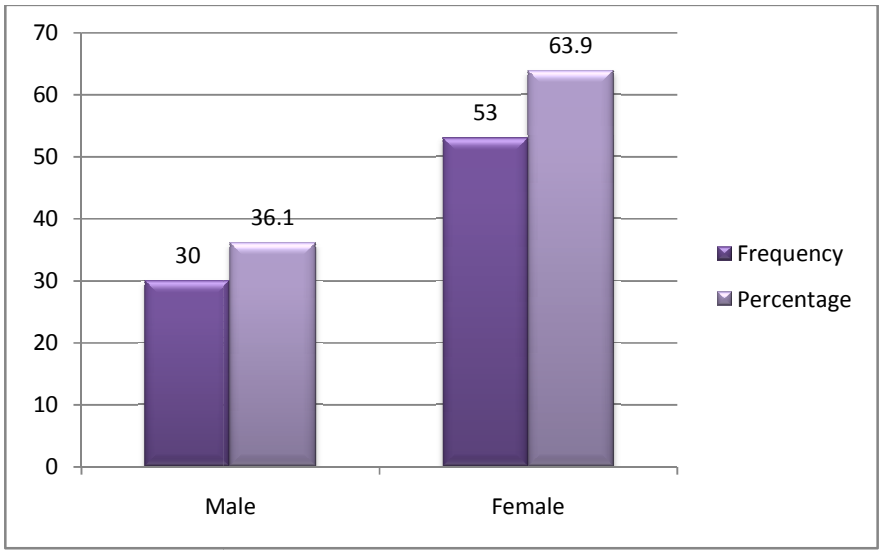


The study group comprises of 53(63.9%) female patients and 30(36.1%) male patients.

TAB- 3 : GENDER

SEX	FREQUENCY	PERCENTAGE
MALE	30	36.1
FEMALE	53	63.9
TOTAL	83	100

FIGURE - 2

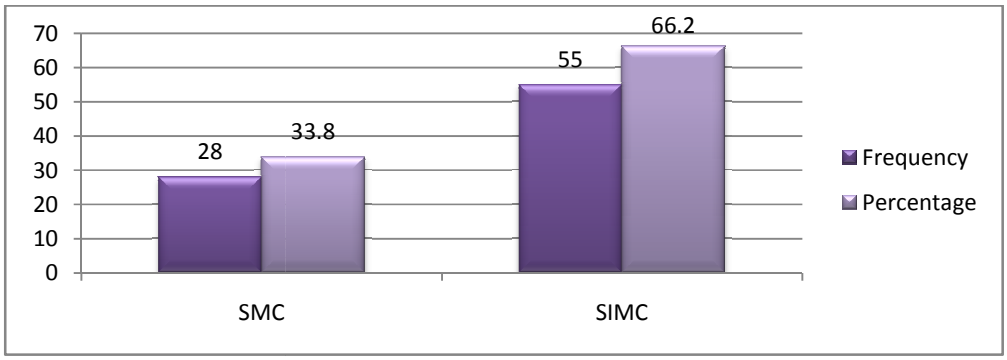


Among the 83 cases 28 were senile mature cataract and 55 were senile immature cataract.

TAB 4 : TYPE OF CATARCT

TYPE	FREQUENCY	PERCENTAGE
SMC	28	33.8
SIMC	55	66.2
TOTAL	83	100

FIGURE – 3

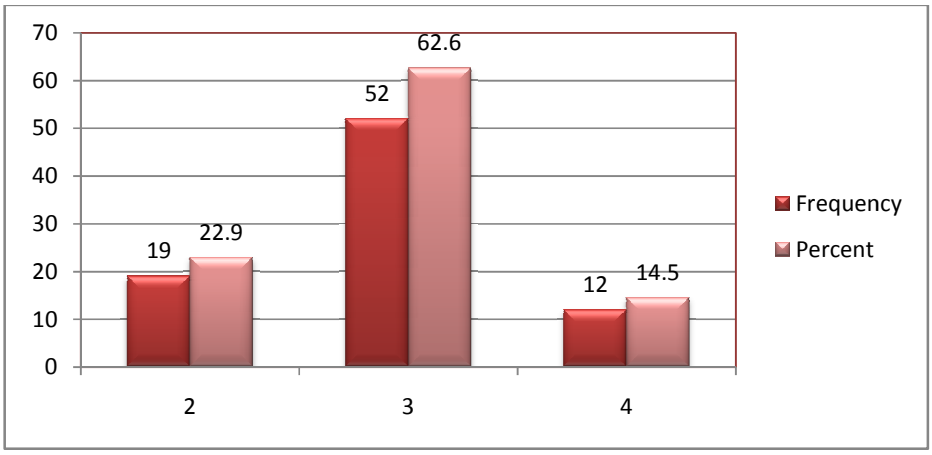


The hardness of the cataract was graded based on the colour of nucleus under slit-lamp examination. Grade III nucleus sclerosis was predominantly found the study group, 52 cases (62.6%). Grade II was found in 19 (22.9%) and grade IV in 12 cases (14.5%).

TAB – 5 : GRADE OF NUCLEUS

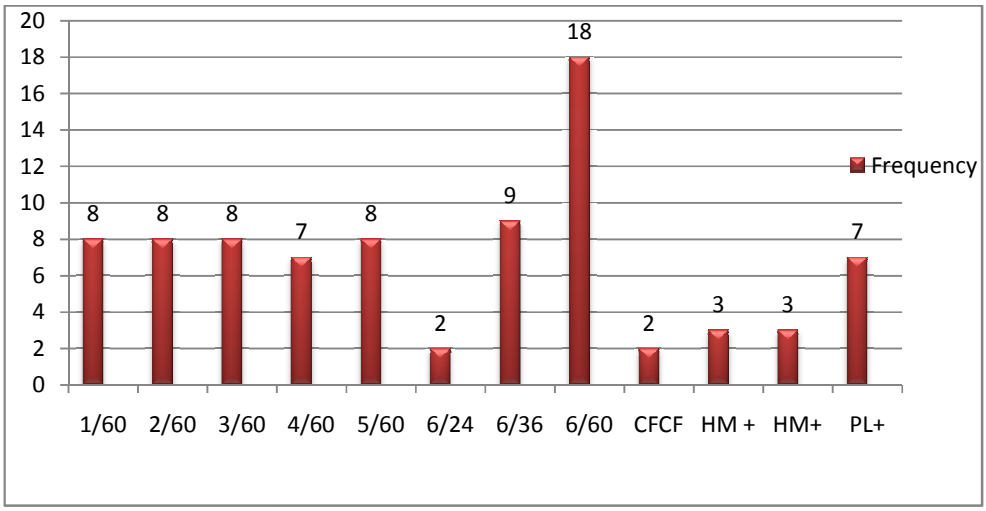
NUCLEUS GRADE	FREQUENCY	PERCENTAGE
2.00	19	22.9%
3.00	52	62.6%
4.00	12	14.5%
TOTAL	83	100%

FIGURE - 4



The pre-operative visual acuity was poor <6/60 in 72cases (86.7%) and borderline in 11(14.5%). Among the 72 cases 15 of them had <1/60 vision.

FIGURE – 5 VISUAL ACUITY (PRE-OP)



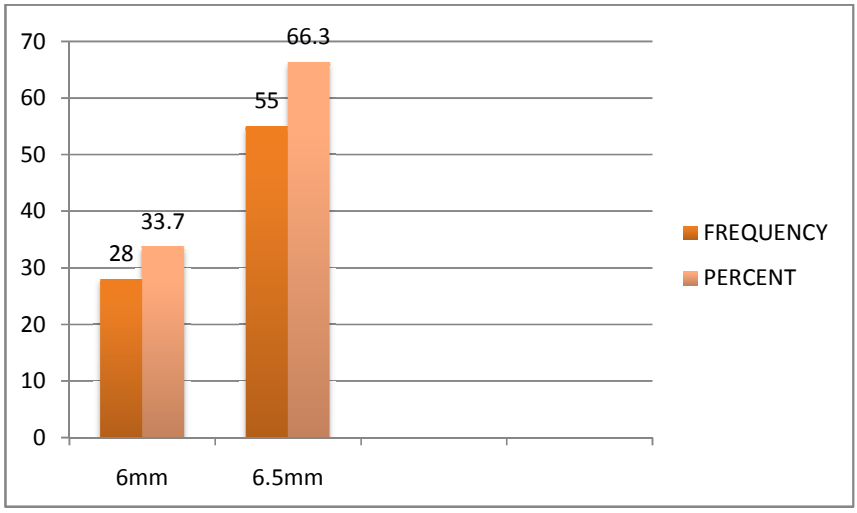
All the patients were operated by a single surgeon. The temporal sclerocorneal tunnel incision was used in all cases. Two site technique of peribulbar anaesthesia was given to all cases.

The size of the incision was either 6 or 6.5mm depending on the pre-operative evaluation. 55 cases (66.3%) had a 6.5mm scleral incision and the remaining 28 cases (33.7%) had a 6mm incision.

TAB-6: INCISION SIZE (MM)

SIZE(MM)	FREQUENCY	PERCENT%
6 MM	28	33.7
6.5MM	55	66.3
TOTAL	83	100

FIGURE - 6

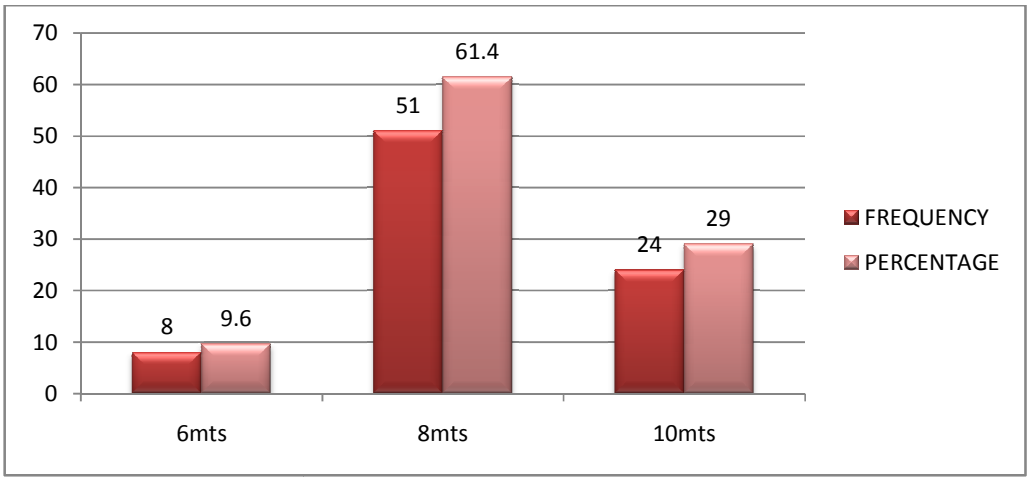


The duration of the surgery was recorded with a stop clock and tabulated. 51 cases (61.4%) were operated in 8 minutes.24 cases (29%) were completed in 10 minutes and 8 cases (9.6%) in 6 minutes. It varies from 6 to 10 minutes and average duration is 8.355 minutes.

TAB – 7: DURATION OF SURGERY

TIME (MINUTES)	FREQUENCY	PERCENTAGE
6	8	9.6
8	51	61.4
10	24	29.0
TOTAL	83	100

FIGURE - 7



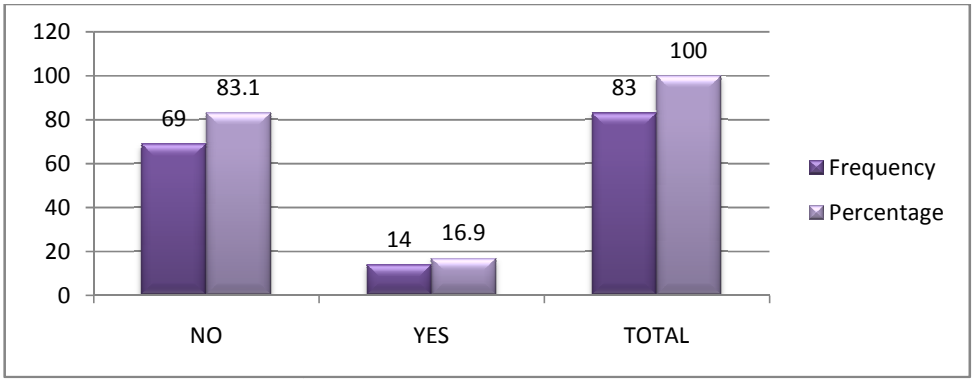
The surgical technique followed was same in all 80 cases. Any difficulties during the surgery and any complications were recorded. 69 cases (83.1%) had an uneventful surgery. 14 cases (16.9%) had complications various stages of the surgery and were managed successfully.

Additional procedure, sphincterotomy with De-wicker's scissors was done in 2cases of undilated pupil to facilitate the nucleus prolapse. Nucleus was broken and delivered in 3cases.

TAB – 8 : INTRAOPERATIVE COMPLICATIONS

COMPLICATION	FREQUENCY	PERCENTAGE
NO	69	83.1%
YES	14	16.9%
TOTAL	83	100%

FIGURE – 8



Continuous curvilinear capsulorhexis is a pre-requisite for all cases of MSICS. In this study the surgeon was able to achieve CCC of size >6 mm all cases. In one case with undilated pupil viscoelastic material and intra-cameral adrenaline was used.

Nucleus management is the most critical step in MSICS. A good Hydroprocedures ensures smooth nucleus prolapse into AC and subsequent delivery. The surgeon had difficulty in the nucleus prolapse in 4 cases and one case required sphincterotomy.

Primary PCO was noted in two cases at the end of cortical aspiration.

The 6.5 mm rigid PMMA intraocular lens was implanted in all cases. Wound closure was done by injecting through the side-port. Sutures were not required in any of those cases.

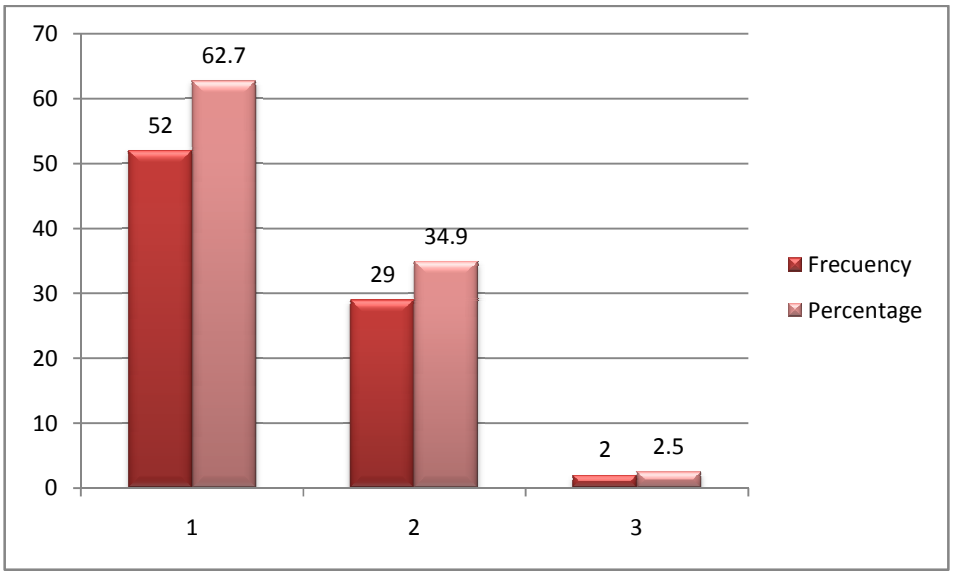
On the first post-operative day vision with pinhole was recorded in all cases. The post-operative visual acuity was graded according to WHO grading of post cataract surgery visual acuity.

The visual acuity was good in 51cases (61.4%), borderline in 30(36.1%). Only 2 cases (1/60 & 3/60) had vision lower than 6/60. In both the cases nucleus delivery was difficult and repeated attempts were done.

TAB-9 : I POD VISION

VISION GRADE	FREQUENCY	PERCENTAGE
1(GOOD)	52	62.7
2(BORDERLINE)	29	34.9
3(POOR)	2	2.5
TOTAL	83	100

FIGURE – 9

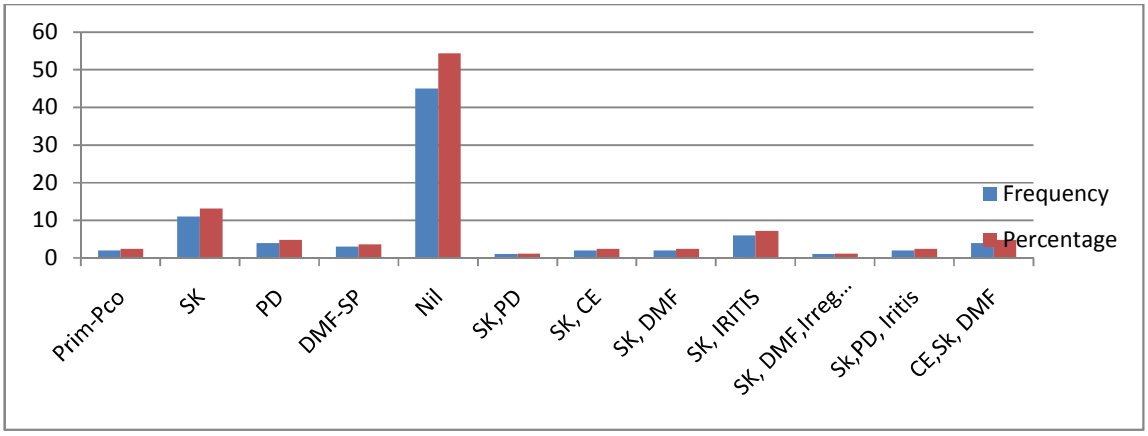


The complications found on *I* post-operative day was recorded in all patients. 45cases (54.22%) were found to be normal on slit-lamp examination. The remaining cases had a single entity of complication or combination of entities.

TAB10 : I POD COMPLICATIONS

COMPLICATION	FREQUENCY	PERCENT
PRIM-PCO	2	2.4
SK	11	13.2
PD	4	4.8
DMF-SP	3	3.6
NIL	45	54.4
SK,PD	1	1.2
SK,CE	2	2.4
SK,DMF	2	2.4
SK,IRITIS	6	7.2
SK,DMF,IRREGULAR PUPIL	1	1.2
SK,PD,IRITIS	2	2.4
CE,SK,DMF	4	4.8
TOTAL	83	100

FIGURE – 10



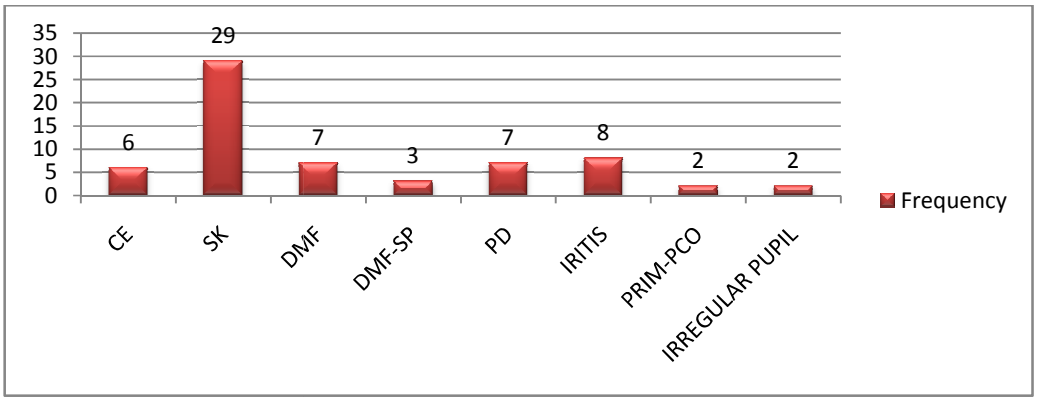
Striate keratopathy was the most common complication, which occurred in 29 cases. Corneal edema was seen in only 6 cases but only 2 cases had poor vision. The edema was more severe in those two cases. Iritis was

noted in 8 cases and all of them responded to medical management. The Descement membrane folds near the side-port were seen in 3 cases.

TAB 11: FREQUENCY OF COMPLICATION I POD

COMPLICATION	FREQUENCY
CE	6
SK	29
DMF	7
DMF-SP	3
PD	7
IRITIS	8
PRIM-PCO	2
IRREGULAR PUPIL	2

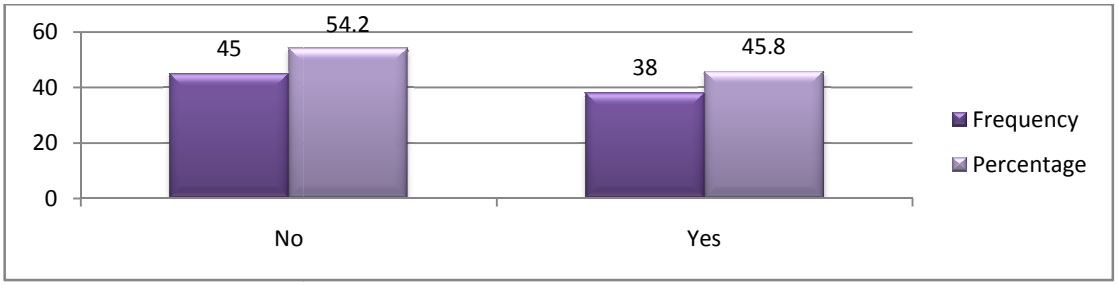
FIGURE 11



TAB 12 : I POD COMPLICATION

COMPLICATION	FREQUENCY	PERCENT%
NO	45	54.2
YES	38	45.8
TOTAL	83	100

FIGURE – 12



Even though the complications were reported in 45.8% of cases, 62.7% of cases had good visual acuity. 34.9% of cases had borderline visual acuity and only 2.5% of cases had poor visual acuity. This implies that the complications found on first post-operative day were of mild in nature and amenable to treatment.

After discharge patients were followed up weekly and the dose of antibiotic-steroid (ciplox-D eye drops) treatment altered according to the examination findings.

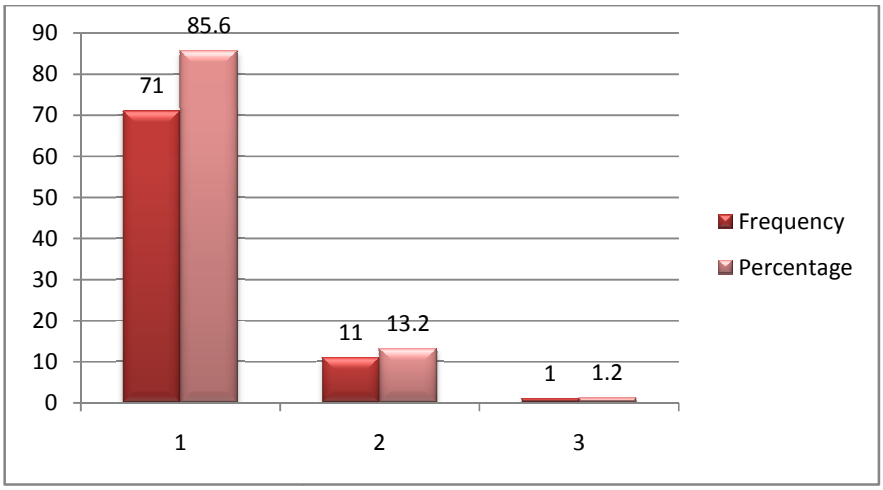
On follow-up all cases were examined under slit-lamp and findings were recorded. The visual acuity was tested with pin-hole. Fundus examination by 90 D lenses were also done to rule out any vitritis.

On first week follow-up, 71 cases (85.5%) had good vision and 11 cases (13.3%) had borderline vision. Only one case had poor vision (4/60) with corneal edema, Descement membrane folds and Iritis. Multiple attempts to deliver the nucleus and prolonged cortical wash were responsible for the Iritis. Prednesolone 1% eye drops were added to the regular ciplox-D eye drops.

TAB- 13: I WEEK VISION

VISION GRADE	FREQUENCY	PERCENTAGE
1(GOOD)	71	85.6
2(BORDERLINE)	11	13.2
3(POOR)	1	1.2
TOTAL	83	100

FIGURE 13



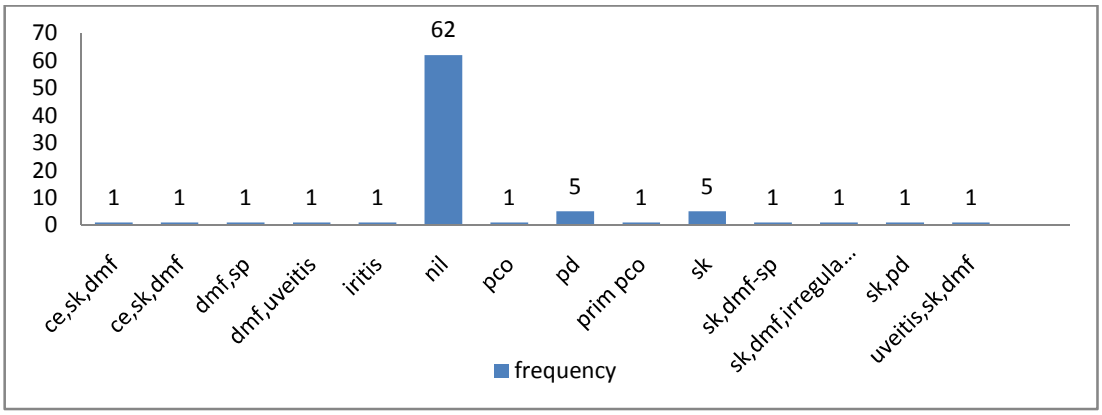
On slit-lamp examination 61 cases (73.5%) were quiet and 22 cases (26.5%) had one or other complications. Around 30 cases have recovered from the complications seen on the first post-operative day. This implies the mild severity of the complications and good response to medical management ensued.

The percentage of cases with complications is 26.5% of cases, but only 1.2% of cases had poor vision. In spite of complications 85.6% of cases had good vision.

TAB – 14: I WEEK COMPLICATION

COMPLICATION	FREQUENCY	PERCENT
CE,SK,DMF,IRREGULAR PUPIL	1	1.2
CE,SK,DMF,PD	1	1.2
DMF-SP	1	1.2
DMF.UVEITIS	1	1.2
IRITIS	1	1.2
NIL	62	74.7
PCO	1	1.2
PD	5	6
PRIM-PCO	1	1.2
SK	5	6
SK,DMF-SP	1	1.2
SK,DMF,IRREGULAR PUPIL	1	1.2
SK,PD	1	1.2
UVEITIS,SK,DMF	1	1.2
TOTAL	83	100

FIGURE 14

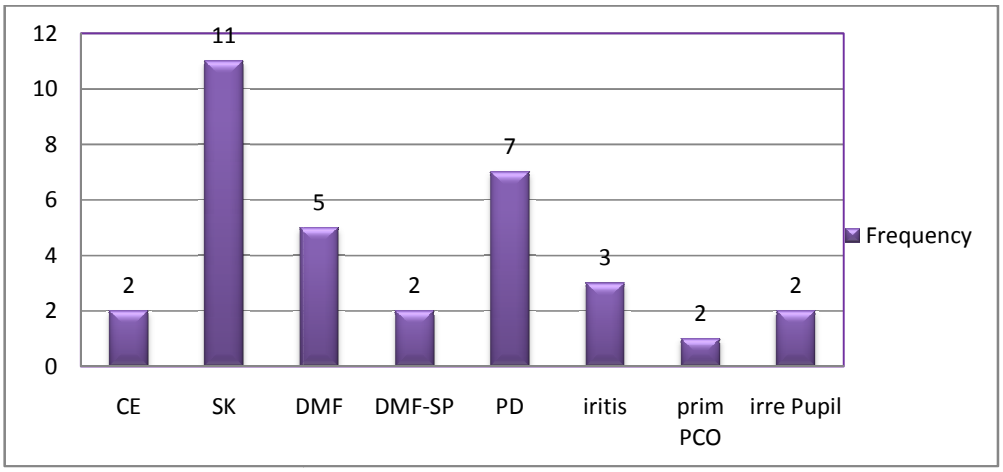


Striate keratopathy is the most common complication (9 cases) and pigment dispersion over the back side of cornea and IOL is second common complication (6 cases). Corneal edema seen in the same two cases as on I POD, with decreased severity. Iritis in 6 cases recovered with medical management and in 2 cases had decreased in severity.

TAB – 15: FREQUENCY OF COMPLICATION(I WEEK)

COMPLICATION	FREQUENCY
CE	2
SK	11
DMF	5
DMF-SP	2
PD	7
IRITIS	3
PRIM-PCO	2
IRREGULAR PUPIL	2

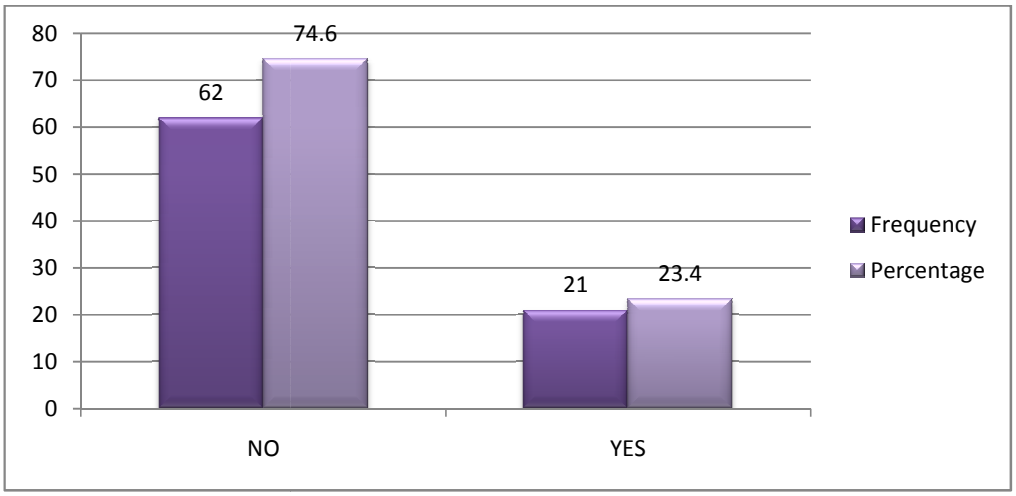
FIGURE – 15



TAB 16 - I WEEK COMPLICATION

COMPLICATION	FREQUENCY	PERCENT%
NO	62	74.6
YES	21	23.4
TOTAL	83	100

FIGURE – 16



The percentage of cases with complications has reduced significantly from 45.8% to 23.4% in one week. This indicates the faster healing of the wound and the anterior segment reaction.

All the patients were monitored periodically depending on the symptoms and clinical findings. On the 6th week follow-up best corrected visual acuity was obtained with objective refraction and automated refractometry. Post-mydriatic test was done and glasses were prescribed.

Complete examination of both anterior and posterior segment was done in all cases. Detailed Fundus examination and intra-ocular pressure measurement were done. The keratometry recording was done to evaluate the corneal astigmatism. The K values were used to measure the surgically induced astigmatism.

Visual acuity was recorded after refraction and graded. This was done to see whether the overall outcome of cataract surgery fulfils the WHO recommendations of cataract surgery outcome.

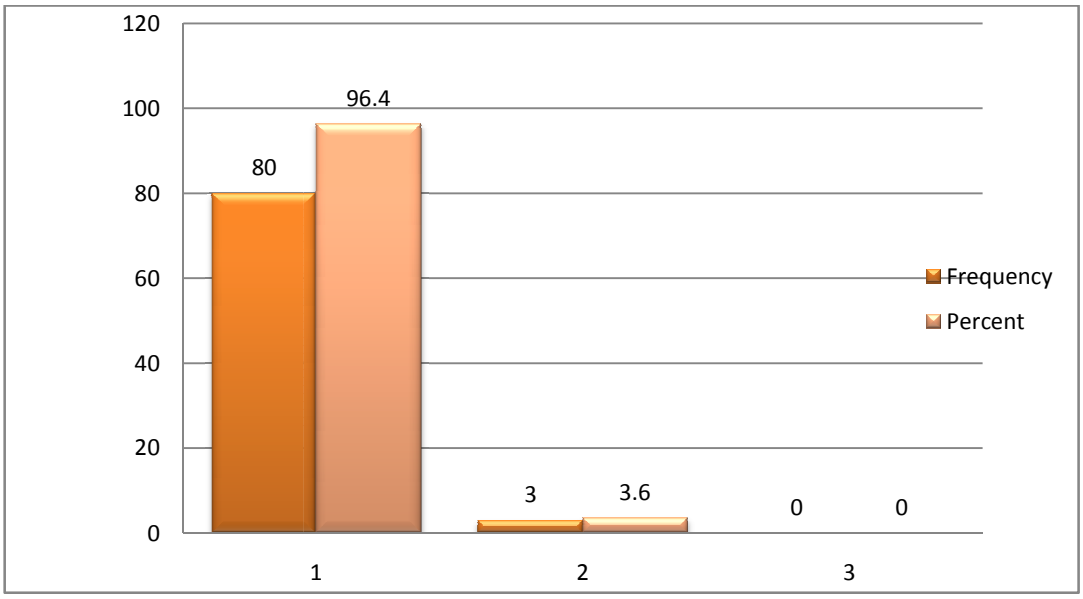
The percentage of cases with good best corrected vision is 96.4% and 3.6% of borderline vision. The 90% best corrected is considered equivalent to 80% of uncorrected vision. The WHO recommends that a good visual outcome of a surgical procedure should aim at 80% of uncorrected vision with <5% of poor vision.

In this study the 80% threshold was attained in I week post-operative follow up (85.6%) itself.

TAB- 17:VI WEEK VISION

VISION GRADE	FREQUENCY	PERCENT%
1(GOOD)	80	96.4
2(BORDERLINE)	3	3.6
3(POOR)	0	0
TOTAL	83	100

FIGURE – 17



80 cases (96.4%) had good best corrected vision and only 3 cases (3.6%) had borderline vision. None of the cases had less than 6/60 vision.

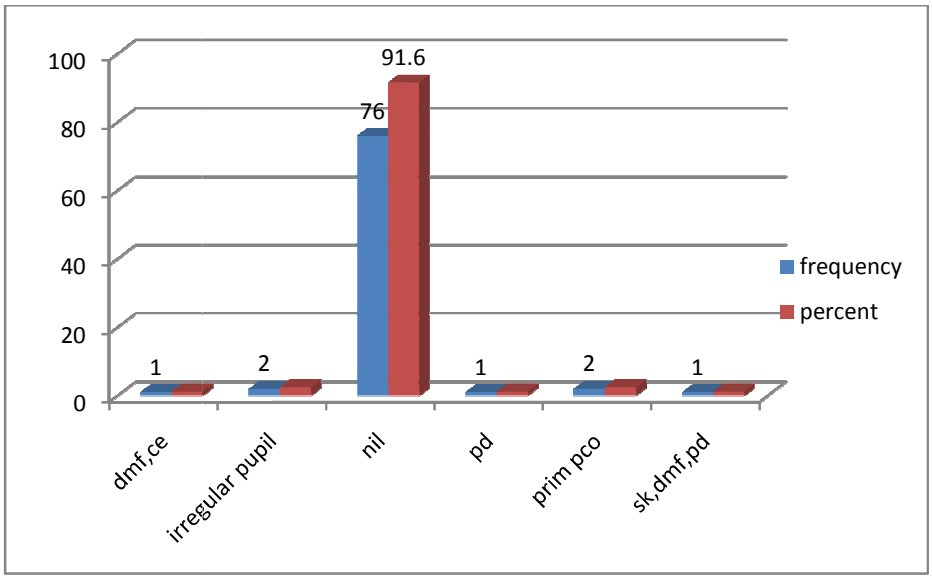
At the end of 6 weeks, 76 cases (91.6%) were complication free. The remaining 7cases (8.4%) had complications. Corneal edema was persistent in one case with Descement membrane folds. Striate keratopathy found in one case was also accompanied by Descement membrane fold. This implies corneal endothelial injury due to surgical trauma or lower endothelial cell count.

The primary PCO in two cases have to be managed after 6 months if needed. One case had PD was evaluated for any IOL mal-position to rule out iris chaffing.

TAB – 18: VI WEEK COMPLICATION

COMPLICATION	FREQUENCY	PERCENT
DMF,CE	1	1.2
IRREGULAR PUPIL	2	2.4
NIL	76	91.6
PD	1	1.2
PRIM PCO	2	2.4
SK,DMF,PD	1	1.2
TOTAL	83	100

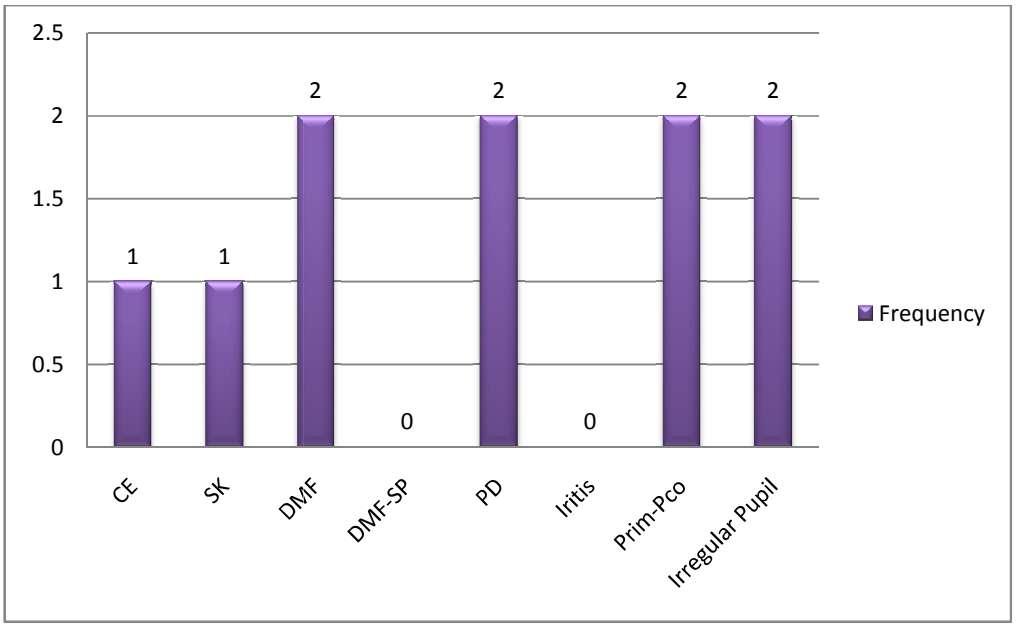
FIGURE – 18



TAB – 19 : FREQUENCY OF COMPLICATION(VI WK)

COMPLICATION	FREQUENCY
CE	1
SK	1
DMF	2
DMF-SP	NIL
PD	2
IRITIS	NIL
PRIM-PCO	2
IRREGULAR PUPIL	2

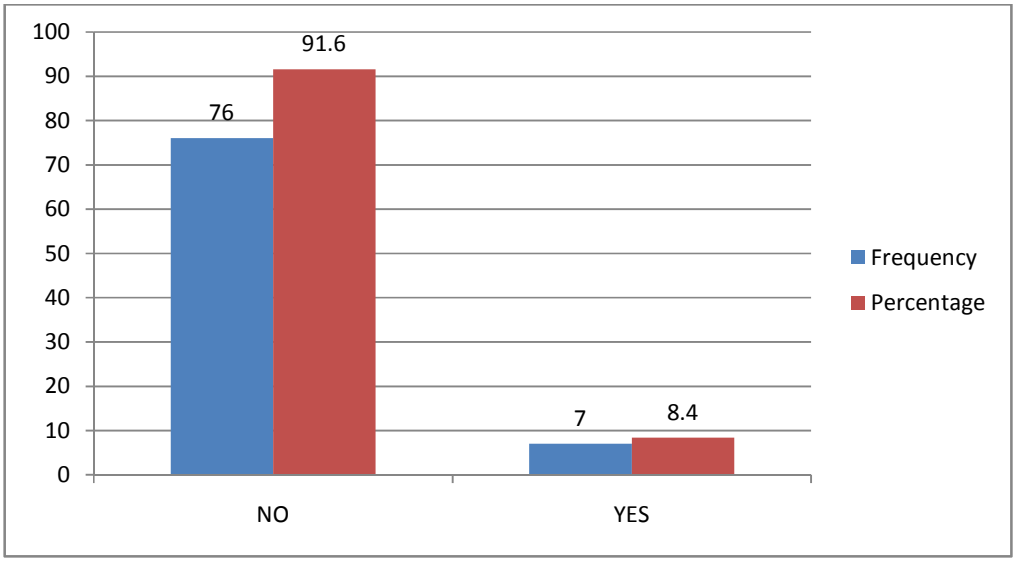
FIGURE - 19



TAB 20 : VI WEEK COMPLICATION

COMPLICATION	FREQUENCY	PERCENT%
NO	76	91.6
YES	7	8.4
TOTAL	83	100

FIGURE – 20



Even though 8.4% of cases have been reported to have complication, none of those cases had poor vision. 96.4% of cases had good visual acuity and only 3.6% cases had borderline visual acuity. This implies that

those complications seen in 8.4% of cases were not of vision impairing in type and severity.

Keratometry was done in all operated cases using automated manual keratometry both pre-operatively as well as post-operatively.the K values were compared to find the change in the corneal astigmatism.

The pre-operative K readings were taken during the pre-operative evaluation and the post-operative readings were taken during the 6^{th} week follow-up. The difference between the pre-op and post-op readings is very minimal in K_1 and small in K_2 values. This confirms the fact that sclera-corneal wound have minimal impact on the corneal curvatures.

FIGURE 21: K VALUES

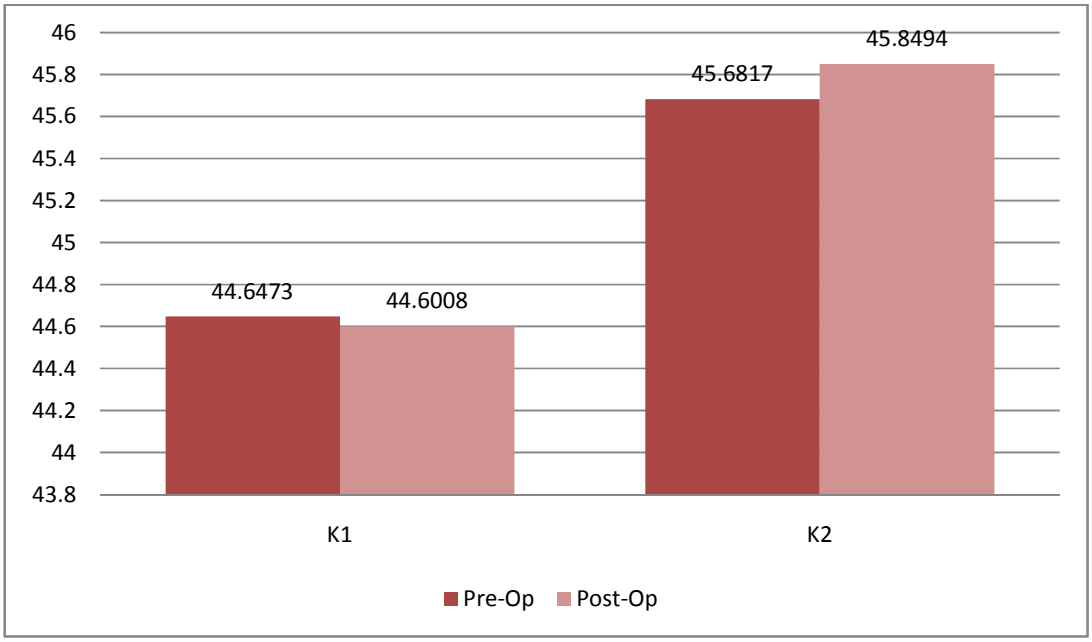


TABLE:21-KERATOMETRY VALUES

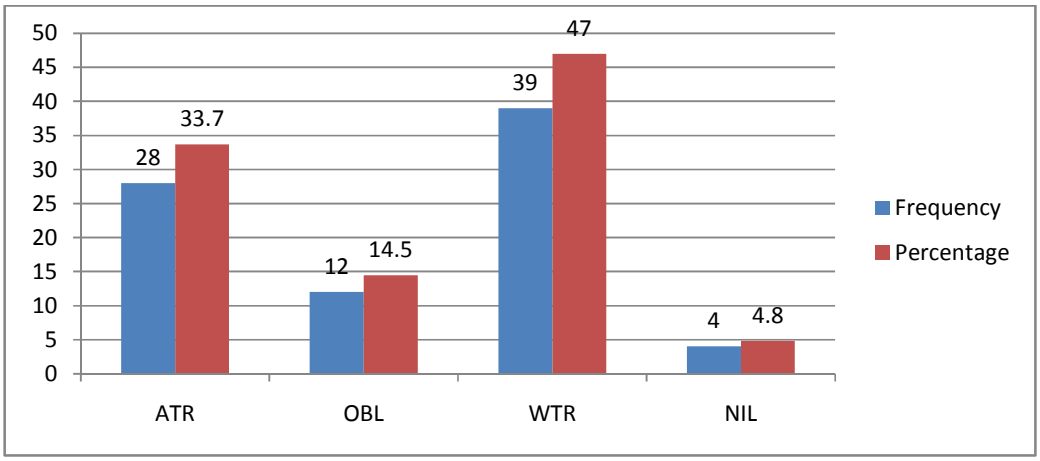
KERATOMETRY VALUES(DIOPTRES)	PRE –OP(MEAN)	POST-OP(MEAN)
K 1	44.6473	44.6008
K2	45.6817	45.8494

The mean corneal astigmatism was calculated from the K readings with axis and all the cases were classified into with the rule, against the rule, oblique and nil astigmatism. The pre-operative corneal astigmatism was WTR (with the rule) in 39 cases, ATR (against the rule) in 28 cases. The OBL (oblique) astigmatism was seen in 12 cases and nil astigmatism in 4 cases.

TAB 22: CORNEAL ASTIGMATISM (PRE-OP)

TYPE	FREQUENCY	PERCENT%
ATR	28	33.7
OBL	12	14.5
WTR	39	47.0
NIL	4	4.8
TOTAL	83	100

FIGURE – 22

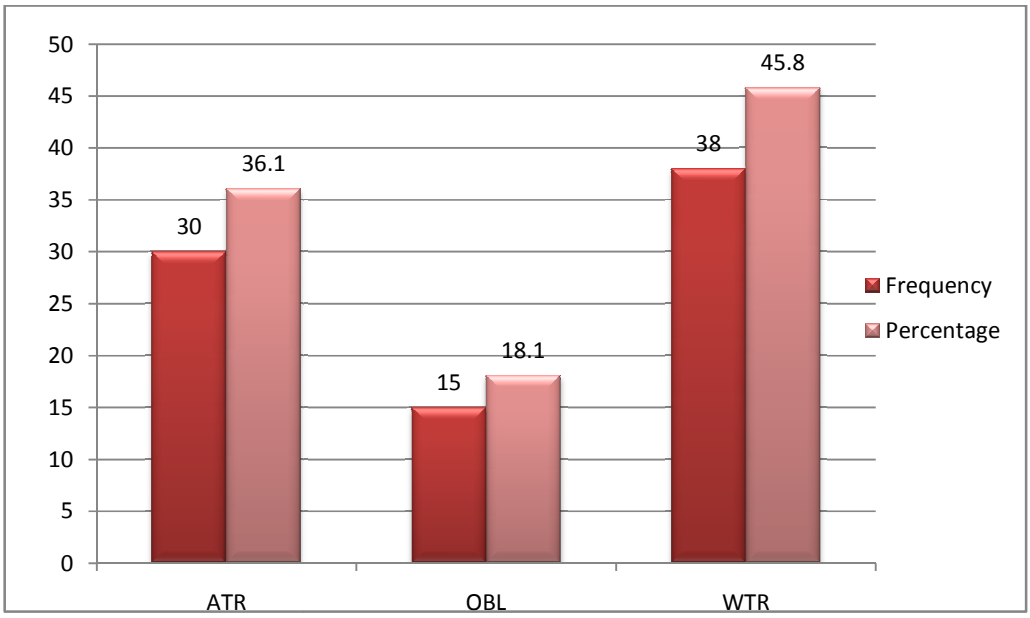


The corneal astigmatism was calculated for all the cases in post-operative period. The cases were classified into three groups namely, with the rule, against the rule and oblique astigmatism. The post-operative corneal astigmatism was WTR (with the rule) in 38 cases and ATR (against the rule) in 30 cases. The OBL (oblique) astigmatism was seen in 15 cases.

TAB – 23 : CORNEAL ASTIGMATISM(POST-OP)

TYPE	FREQUENCY	PERCENT%
ATR	30	36.1
OBL	15	18.1
WTR	38	45.8
TOTAL	83	100

FIGURE – 23



The distribution of types of astigmatism on post-operative assessment appeared similar to that of pre-operative astigmatism. This implies the astigmatic neutrality of the temporal scleral tunnel incision used in this study.

DISCUSSION

Phacoemulsification is considered to be the gold standard of cataract surgery. The manual SICS was an innovative technique developed in developing world. The preference of MSICS in our country is attributed to various reasons including demographic profile, cataract burden, cost-effectiveness and socioeconomic issues.

Multiple studies have evaluated the efficacy and safety of MSICS compared to conventional ECCE and phacoemulsification. The studies have confirmed the superiority of MSICS compared to conventional ECCE in terms of lesser complication, better and faster visual rehabilitation. They have shown evidence that manual SCIS was significantly faster, less expensive, and less technology dependent than phacoemulsification[16].

In manual small incision cataract surgery, the surgeon can choose the incision site, type, length and depth of tunnel according to the preoperative evaluation. In our country where more number of mature, hyper mature and hard cataracts are presented in a camp setup the surgeon has to be well equipped to do various methods of cataract surgery depending on the individual case scenario.

The various modifications of MSICS provide the surgeon an opportunity to give the patients the maximum visual outcome with the existing limited health-care resources.

But the disadvantage lies in the higher level of astigmatism in MSICS due to the length of the incision and time taken for visual rehabilitation. The length of incision has to larger than phacoemulsification to facilitate extraction of the lens and implantation of IOL. Rigid IOLs are definitely much lower cost than foldable IOLs. So the length of incision cannot be altered much but by changing the site of incision and type of incision surgically induced astigmatism can be reduced.

A prospective clinical study of temporal manual small incision cataract surgery was done to measure the visual outcome, preoperative technique related complications, postoperative complications and visual rehabilitation of temporal manual small incision cataract surgery.

Demographic profile of this study showed more female patients than male patients and the average age group between 40 to 70 years. The cataract burden is relatively more in females conforming to the epidemiological profile of cataract burden in south India[41].

This study population includes 75.9% of cases in 50 to 70 years age group and only 7% of cases in 70 to 80 years age group. Significantly

15.6% of cases occurred in 30 to 50 years age group. This premature onset of senile cataract is responsible for increased cataract incidence and its economic impact. This factor indicates the increased importance of cost effectiveness of a surgical technique.

The definitive treatment of cataract is surgery only. So the available surgical services have to be affordable and be capable of effective visual rehabilitation. The less dependence of instrumentation and short learning curve of the technique favours the MSICS compared to phacoemulsification.

Various reasons including accessibility and awareness are responsible for the late presentation of cataract cases for surgery. This factor mandates a surgical technique capable of giving good visual outcome in mature cataract and hypermature cataract.

This study group had 28(33.8%) senile mature cataract cases and 55 senile immature cases. but the overall visual outcome at 6 weeks was good in 80 cases (96.5%) and zero incidence of poor vision. Temporal small incision cataract surgery can be considered to be safe and effective in all types of cataract.

The cases with nuclear hardness II , III, and IV were included in the study. In spite of increased hardness those cases had good visual outcome

and lesser complications. The correlation between these variables was analysed using chi-square test.

The correlation between the type of cataract and Intra-operative complications were analysed and the p value was significant (p=0.017).The p value between the type of cataract and the first post-operative complication was not statistically significant (p=0.735). This shows that the intra operative complications are amenable to the management. Those complications have minimal impact on the visual outcome and this technique can be used in all types of cataract.

Nucleus hardness and intra-operative complication were analysed as two variables and found to be statistically insignificant (p=0.044). The correlation between nucleus hardness and 6 week complication was more than 0.05(p=0.082). The intra operative complications are not influenced by the hardness of cataract, which makes the surgical technique safe for grades of nucleus sclerosis.

Peribulbar anaesthesia was used for all the cases and no anaesthesia related complications were reported.

The incision size is in small incision cataract surgery is not small, but 'smaller'[6]. Wound construction plays a greater role in MSICS than in the

case of phacoemulsification, where the size and shape of wound is same in all cases[6]. The wound in MSICS has to be carefully planned depending on the type of technique, grade of nuclear sclerosis, amount of astigmatism and the condition of the endothelium[6].

The straight sclera- corneal tunnel incision of 6mm and 6.5 mm was used. There is no difference in the rate of intra-operative, post-operative c complications and duration of the surgery between the two groups. The correlation of between incision size and intra-operative complications was not statistically significant (p=0.091). The configuration of the incision plays the major role than the length of the incision.

The duration of the surgery was analysed with intra-operative complications and was not significant (p=0.382).The average duration of the surgery in this study is approximately 8.5 minutes. This implies that the number of surgeries done by the cataract surgeon per hour will be in the range of 6-7 cases. This benefit is more significant in our country, where increased cataract backlog is burdened by limited healthcare resources.

The common intra-operative complications were mainly in nucleus management. The first post-operative day complications are outcomes of the intra-operative complications and the subsequent management. The correlation between intra-operative complication and first day

complication were analysed as two variables. The correlation was significant with first day complication and the p value is 0.01. The p value between intra-operative complaints and 6 week post-operative compliant was statistically significant (p=0.00).

The outcome any cataract surgery can be measured in various parameters. The benefit of the patient is measured not only in the improvement of central vision and also the clarity of vision. The improvement in central form vision was recorded as the increased lines of Snellen chart lines or the E charts read by the vision. The improvement in quality of vision was documented by the changes in corneal astigmatism.

The K_1 value pre and post-operative was analysed using the paired t test and p value was not significant (p=0.545). The analysis of K_2 value pre and post-operative showed significant change and the p value was not significant (p=0.059).

The analysis of mean corneal astigmatism pre and post-operative was found to be significant (p=0.00). The change in corneal astigmatism ranges from -1.25 to 2.75 with an average of 0.3575±0.82666. The distribution of type of corneal astigmatism was similar in both pre-operative and post-operative groups.

The pre-operative corneal astigmatism had WTR in 47% of cases and ATR in 33.7% of cases. The OBL astigmatism was seen in 14.5% of cases and nil astigmatism in 4.8% of cases.

The post-operative corneal astigmatism had WTR in 45.8% of cases and ATR in 36.1% of cases. The OBL astigmatism was seen in 18.1% of cases.

The average percentage of the various types of corneal astigmatism has not altered much, but the conversion of one type of astigmatism into another type was noted.

Among the 28 cases of ATR, 23 cases (82.14%) were converted into WTR type. Four cases (14.28%) were converted into OBL and only one case (3.57%) remained ATR. This implies the potential of using the temporal incision in correction of ATR astigmatism. The superior approach may aggravate the existing against the rule astigmatism, which is seen in significant percentage of elderly population.

As the cases with high astigmatism were excluded from the study, the potential of using temporal approach in astigmatic correction could not be assessed.

CASE STUDIES

VISUAL OUTCOME

Ruit S, et al[64] study reported good (>6/18) visual acuity on I POD vision in >50% of cases.

The present study showed good in 61.4% of cases.

The post-operative BCVA was good in 98% at 6 months follow-up in Ruit S, et al[64] , whereas this study showed good BCVA in 96.4% at 6 weeks itself.

Zawar S V, et al[66] study reported good I POD vision in 81.7% and at 2 week follow-up in 82.6% of cases.

Even though this study showed good I POD in only 61.4% of cases, at I week follow-up good UCVA was attained in 85.5% of cases.

In Zawar S V, et al[66] the post-operative BCVA was good (>6/18) in 93.4% at 6weeks and was poor (<6/60) in 1.2% of cases.

The present study showed good (>6/18) post-operative BCVA in 96.4% at 6 weeks and poor (<6/60) in 3.6% of cases.

Singh V K, Winter I, Surin L, et al[40] study reported good (>6/18) UCVA in 77.7%, borderline (6/24-6/60) UCVA in 22% and poor (<6/60) UCVA in 1% on the first post-operative day examination.

The present study showed good UCVA in61.4%, borderline in 36.1% and poor in 2.5% of cases.

Siddique M, et al[50] study reported good (>6/18) BCVA in 92.2% of cases at six weeks follow-up. The present study showed 96.4% good BCVA.

COMPLICATIONS

Zawar S V, et al[66] study reported transient corneal edema in 6.8% of cases. Iris prolapse (0.15%) and wound leak (0.15%) are the other reported complications.

Singh V K, Winter I, Surin L, et al[40] study reported Iritis in 1.12% of cases on the first post-operative day.

Ruit S, et al[64] study reported Hyphaema in 29.62% of cases on the first post-operative day. No other significant complications were reported.

Kongsap P[36] study reported Hyphaema in 6.2% of cases, and transient corneal edema in 6.2% of cases. Iris prolapse was reported in 4.62% of cases.

The present study showed corneal edema in 9.63% and Iritis in7.2% of cases on the first POD. At one week follow-up corneal edema reduced to 7.2% and Iritis reduced to 2.4% of cases.

At 6 week follow-up, corneal edema in 1.2% of cases and Descemet membrane folds in 1.2% of cases were documented.

DURATION OF SURGERY

Ruit S, et al[64] study reported 9 minutes as the average case time, which included both operating & turn over time.

Zawar S V, et al[66] study 6 minutes as the average surgical time.

Singh V K, Winter I, Surin L, et al[40] study reported the mean surgical time for temporal MSICS as 5 minute 18 seconds. Only 11.2% of cases in that study had a surgical time >6 minutes.

The present study reported 8.5 minutes as the average surgical time.

SUMMARY

A prospective clinical study of temporal manual small incision cataract surgery was done in the department of ophthalmology, Coimbatore medical college hospital from October 2011 to September 2012.the total number of cases studied was 83.

The study group included patients in age group ranging from 35 years to 80 years and the mean age was 60.5 years.

Female patients were 53 and male patients were 30 in the study group.

The study was comprised of 28 senile mature cataract cases and 55 senile immature cataract cases.

The study population had all three grades of nucleus sclerosis with grade III in 52 cases and grade IV in 12 cases. Nuclear sclerosis grade II was seen in 19 cases.

The pre-operative visual acuity was <6/60 in 72 cases. Among them 15 cases had vision <1/60.

A single surgeon operated for all the cases. Peribulbar anaesthesia was used in all the cases.

The temporal sclerocorneal incision of 6.5 mm was used in 55 cases. The remaining 28 cases were operated through 6mm incision.

All the cases underwent the similar technique of temporal manual small incision cataract surgery. Through the temporal sclerocorneal incision nucleus was extracted with phaco sandwich technique. Capsulorhexis and Hydroprocedures were done in all cases to facilitate the nucleus prolapse into the AC. The rigid 6.5 mm PCIOL was implanted in all the cases after complete irrigation and aspiration.

The surgery was uneventful in 69 cases.

The most common intra-operative complication was nucleus rotation difficulty due to undilated pupil in two cases. The nucleus delivery was done after breaking into segments was done in two cases. Primary PCO was noted in two cases.

The average surgical time was 8.35 minutes.

The most common first post-operative complication was striate keratopathy and the mild corneal edema with Descemet membrane folds was the second common complication.

The UCVA on the I POD was >6/18 in 52 cases and <6/60 in 2 cases.

The most common complication reported in I week follow-up was striate keratopathy.

The UCVA on I week follow-up was >6/18 in 71 cases and <6/60 in only one case.

No complications were seen in 76 cases. Two cases had pre-existing PCO and the remaining cases had minimal striate keratopathy.

The BCVA on the VI week follow-up was >6/18 in 80 cases and 6/18 - 6/60 in 3 cases. None of the operated cases had vision <6/60.

There was no statistically significant change in the K1 values and a small change in K 2 values.

85% of the study population attained good UCVA (>6/18) in the first week, thus provided the early rehabilitation to the patients.

Thus the temporal manual small incision cataract surgery is found to be

- Suitable for all grades of cataract cases
- Capable of providing good visual outcome in mature cataract cases also.
- Less time consuming
- Reproducible and reliable technique
- Less technology dependent
- Safe with lesser complication rate
- Capable of providing good post-op vision, both UCVA & BCVA
- Early visual rehabilitation
- Economical (time saving, less instruments, rigid PMMA IOLS)
- Suitable for high volume surgery setups

The temporal manual small incision cataracts surgery fulfils the WHO criteria for good surgical technique. It is a safe and reliable method of cataract surgery. It is complementary to the other standardised techniques namely phacoemulsification, superior manual small incision cataract surgery.

CONCLUSION

In this study the evaluation of Temporal Manual Small incision Cataract Surgery was found to have the following outcomes:

The Temporal Manual Small incision Cataract surgery is an effective and safe method of cataract extraction.

The intra-operative complication rate was less, can be avoided by doing meticulous Hydroprocedures.

The post-operative complications were less severe in nature and responded well to medical management.

Early visual rehabilitation was attained in majority of the cases.

BIBLIOGRAPHY

1. Sihota R, Tandon R. Parson's Diseases of the Eye, 21_{st} edition. Appendices III: 585-86.
2. Brian G and Taylor H. Cataract Blindness- challenges for the 21_{st} century. Bulletin of the World Health Organization, Nov, 2001; 79; 3:249-56.
3. Richard P. Floyd, History of Cataract Surgery, Albet & Jakobeic, Principles and Practice of Ophthalmology, 2^{nd} Edition Volume 2; 104:1463-74.
4. Jack D Holladay, Thomas V Cravy and Douglas D Koach, Calculating the astigmatism after ocular surgery, J Cataract refractive surgery Sep 1992;18:429-32.
5. Jaffe N S, Jaffe M S, Jaffe G F. Surgical anatomy of lens;I:48-51.
6. Haldipurkar S S, Shikari H T, and Gokhale V. Wound construction in manual small incision cataract surgery.
7. Akura J, Kaneda S, Hatta S, et al. Controlling astigmatism in cataract surgery requiring relatively large self-sealing incisions. J Cataract refractive surgery. Nov, 2000; 26:1650-59.
8. Steinert's Cataract Surgery, Retrobulbar and peribulbar anaesthesia for cataract surgery; 8:100-101.

9. Casson R J and Salmon J F. Combined surgery in the treatment of patients with cataract and primary open-angle glaucoma. J cataract refractive surgery, Nov 2001; 27:1854-63.

10. Nagaki Y, Hayasaki S, Kadoi C, et al. Bacterial endophthalmitis after small-incision cataract surgery. Effect of incision placement and intraocular lens type. J cataract refractive surgery, Jan 2003; 29:20-26.

11. Packer M, Chang D F, Dewey S H, et al. Prevention, diagnosis, and management of acute postoperative bacterial endophthalmitis. J Cataract Refract surgery 2011; 37:1699-714.

12. Kurt A, Febbraro223- J-L. Transconjunctival corneoscleral tunnel "Blue line" cataract incision. J Cataract Refract surgery 2000; 26:245-49.

13. Haripriya A, Chang D F, Reena M, et al. Complication rates of phacoemulsification and manual small-incision cataract surgery at Aravind Eye Hospital. J Cataract Refract surg 2012; 38:1360-69.

14. Gokhale N S and Sawhney S. Reduction in Astigmatism in Manual Small Incision Cataract Surgery through Change of Incision Site. Indian J Ophthalmol 2005; 53:201-203.

15. Khan M T, Jan S, Hussain Z, et al. Visual Outcome and Complication of Manual Sutureless Small Incision Cataract Surgery. Pak J Ophthalmol 2010; 26; 1:32-38.

16. Venkatesh R, Tan C S H, Sengupta S, et al. Phacoemulsification versus manual small-incision cataract surgery for white cataract. J Cataract Refract Surg 2010; 36:1849-54.

17. Gogate P M, Deshpande M, Wormland R P, et al. Extracapsular cataract surgery compared with manual small incision cataract surgery in community eye care setting in western India: a randomized controlled trial. Br J Ophthalmol 2003; 87:667-72.

18. Vanaja V and Sivakumar. Obtaining Emmetropia through scleral tunnel. J of TNOA June 2004; 43(2):64-67.

19. Buzard K A and Shearing S. Comparison of post-operative astigmatism with incisions of varying length closed with a horizontal suture and with no suture. J Cataract Refract Surg, Supplement 1991; 17:734-39.

20. Masnec-Paskvalin S, Cima I, Ivekovic R, et al. Comparison of preoperative and postoperative Astigmatism after Superotemporal or Superonasal Clear corneal incision in Phacoemulsification. Coll. Antropol 2007; 31(1):199-202.

21. Diseases of the lens and vitreous; Glaucoma and hypotony, Duke-Elder's System of ophthalmology, volume XI; 3:63-67.

22. Brian B B, Emery J M, Brown N A P, et al. The Lens, Cataract, and its management. Principles and practice of ophthalmology. Peyman-Sanders-Goldberg volume I; 7:489-625.

23. Beebe D C. Lens. Adler's Physiology of the Eye. Tenth edition. Section III; 5:117-49.

24. Garg A, Alio J L. The 3-in-1 simplified approach for ECCE, MSICS and Phacoemulsification. Surgical Techniques in Ophthalmology. Cataract Surgery. Section I; 5:25-38.

25. Garg A, Alio J L. The dynamics of capsulorhexis. Surgical Techniques in Ophthalmology. Cataract Surgery. Section I; 6:39-43.

26. Garg A, Alio J L. Nucleus Management by Visco-expression Technique in Manual SICS. Surgical Techniques in Ophthalmology. Cataract Surgery. Section I; 8:52-56.

27. Foster C S, Azar D T, and Dohlman C H. Smolin and Thoft's The Cornea, Scientific Foundations & Clinical Practice. Fourth edition. Part I; sect II: 169-73.

28. Sugar A, Sadri E, Dawson D G, et al. Refractive stabilization after temporal phacoemulsification with foldable acrylic intraocular lens implantation. J Cataract Refract Surg, Nov 2001; 27:1741-45.

29. Basic and clinical science course. Lens and Cataract. American Academy of Ophthalmology 2011-12; 11:223-24.

30. Murthy G V S, Gupta S K, Bachani D. National Programme for Control of Blindness. The Principles and Practice of Community Ophthalmology, 2002:150-60.

31. Junejo S A, Jatoi S M, Khan N M. Nonphaco Sutureless cataract extraction through temporal approach. J Ayub Med Coll Abbottabad 2009; 21; 2:136-40.

32. Pawar V S, Sindal D K. A Comparative study on the Superior, Supero-Temporal and the Temporal Incisions in Small Incision Cataract Surgeries for Post Operative astigmatism. JCDR 2012; 4665:2400.

33. Merriam J C, Zheng L, Urbanowicz J, et al. Change on the horizontal and vertical meridians of the cornea after cataract surgery. Tr Am Ophth Soc 2001; 99:187-97.

34. Sujithra, Dhar M, Shanmugham R. Assessment of merits of clear corneal incision over scleral tunnel incision in phacoemulsification. Kerala journal of ophthalmology 20; 3:259-62.

35. Gharaeel H, Kargozari A, Sharepouri M, et al. Correlation between corneal endothelial cell loss and location of phacoemulsification incision. Journal of Ophthalmic and Vision Research 2011; 6; 1:13-17.

36. Kongsap P. Visual outcome of manual small-incision cataract surgery: Comparison of modified Blumenthal and Ruit technique. International Journal of Ophthalmology 2011; 4; 1:62-65.

37. Asano K, Nomura H, Iwano M, et al. Relationship between astigmatism and aging in middle aged and elderly. Japanese Journal of Ophthalmology 2005; 49:127-33.

38. Sommer A, Spivey B E. Access to cataract Surgical Services: International Ophthalmology Accepts the Challenge June 2011; 151:925-27.

39. Oshika T, Klyce D S, Applegate A R, et al. Changes in corneal wave front aberrations with aging. Investigative Ophthalmology & Visual Science, June 1999; 40; 7:1351-55.

40. Singh S K, Winter I, Surin L. Phacoemulsification versus small incision cataract surgery (SICS): which one is a better surgical option for immature Cataract in developing countries. Nepal Journal of Ophthalmology 2009; 1; 2:95-100.

41. P K Nirmalan, R D Thulasiraj, V Maneksha, et al. A population based eye survey of older adults in Tirunelveli district of south India: blindness, cataract surgery, and visual outcomes. British J of Ophthalmology. Jo.bmj.com November 2012.

42. Hennig A. Non-phaco Cataract Surgery: A Solution to reduce worldwide cataract Blindness? Community Eye Health 2003; 16; 48:49-5.

43. Sandford-Smith J. Sutureless SICS: Principles and steps. Community Eye Health 2003; 16; 48:52-54.

44. Schroeder B. Sutureless cataract extraction: Complications, Management and Learning curves. Community Eye Health 2003; 16; 48:58-60.

45. Gudmundsdottir E, Jonasson F, Jonsson V, et al."With the rule" astigmatism is not the rule in elderly. Reykjavik Eye Study: A Population based study of refraction and visual acuity in citizens of Reykjavik 50 years and older. Acta Ophthalmol. Scand. 2000; 78:642-46.

46. Zaman M, Ali Shah A, Hussain M, et al.Outcome of Sutureless manual extracapsular cataract extraction. J Ayub Med Coll Abbottabad 2009; 21; 1:39-42.

47. Gogate M P. Small incision cataract surgery: Complications and mini-review. Indian J Ophthalmol Jan-Feb 2009; 57; 1:45-49.

48. Chang D F. Tackling the greatest challenge in cataract surgery. Br J of Ophthalmol 2005; 89:1073-74.

49. Venkatesh R, Tan C S H, Kumar T T, et al. Safety and efficacy of manual small incision cataract surgery for phacolytic glaucoma. Br J Ophthalmol 2007; 91:279-81.

50. Siddique M, Ashraf M, Malik Z A, et al. Comparison of visual outcome between superior scleral tunnel and temporal scleral tunnel approaches in manual small-incision cataract surgery. Al-Shifa Jr of Ophthalmol 2009; 5; 1:35-41.

51. Kapoor H, Chatterjee A, Daniel R, et al. Evaluation of visual outcome of cataract surgery in an Indian eye camp. Br J Ophthalmol 1999; 83:343-46.

52. Hennig A, Kumar J, Yorston D, et al. Sutureless cataract surgery with nucleus extraction: outcome of a prospective study in Nepal. Br J Ophthalmol 2003; 87:266-70.

53. Minassian D C, Mehra V. 3.8 Million blinded by cataract each year: Projections from the first epidemiological study of incidence of cataract blindness in India. Br J Ophthalmol 1990; 74:341-43.

54. Riaz Y, Mehta J S, Wormald R, et al. Analysis 3.1. Comparison 3 Extrcapsular extraction with PCIOL versus Manual small incision Extraction with PCIOL. Surgical interventions for age-related cataract (Review). http://www.thecochranelibrary.com

55. Riaz Y, Mehta J S, Wormald R, et al. Analysis 3.2. Comparison 3 Extrcapsular extraction with PCIOL versus Manual small incision Extraction with PCIOL. Surgical interventions for age-related cataract (Review). http://www.thecochranelibrary.com

56. Riaz Y, Mehta J S, Wormald R, et al. Analysis 3.3. Comparison 3 Extrcapsular extraction with PCIOL versus Manual small incision Extraction with PCIOL. Surgical interventions for age-related cataract (Review). http://www.thecochranelibrary.com

57. Lansingh C, Carter M J, Martens M. Global Cost-effectiveness of Cataract Surgery. Ophthalmology 2007; 114:1670-78.

58. Venkatesh R, Veena K, Ravindran R R. Capsulotomy and Hydroprocedures for nucleus prolapse in manual small incision surgery. Indian J Ophthalmol 2009; 57; 5:15-18.

59. Rao S K, Lam D S. A Simple technique for nucleus extraction from capsular bag in manual small incision surgery. Indian J Ophthalmol 2005; 5; 3:214-15.

60. Parkar T, Gogate P, Deshpande M, et al. Comparison of subtenon anaesthesia with peribulbar anaesthesia for Manual small incision cataract surgery. Indian J Ophthalmol 2005; 53:255-59.

61. Venkatesh R, Chang D F, Muralikrishnap R, et al. Manual Small Incision Cataract Surgery: A Review. Asia-Pac J Ophthalmol 2012; 1:113Y119.

62. Gogate P. Clinical Trial of Manual Small Incision Surgery and Standard Extracapsular Surgery. Community Eye health 2003; 16; 48:54-55.

63. Kohnen S, Neuber R, Kohnen T. Effect of temporal and nasal limbal tunnel incisions on induced astigmatism after phacoemulsification. J Cataract Refract Surg 2002; 28:821-25.

64. Ruit S, Tabin G, Chang D, et al. A Prospective randomized clinical trial of phacoemulsification vs. Manual Sutureless small-incision Extracapsular cataract surgery in Nepal. Am J Ophthalmol 2007; 143:32-38.

65. Malik VK, Kumar S, Kamboj R, et al. Comparison of astigmatism following manual small incision cataract surgery-superior and temporal approach. Nepal J Ophthalmol 2012; 4; 7:54-58.

66. Zawar S V, Gogate P. Safety and efficacy in temporal small incision cataract surgery in India. European J of Ophthalmol 2011; 21; 6; 748-53.

67. Abraham D. Duke-Elders practice of Refraction. Tenth edition; III: 66-70.

68. Ionides A, Minassian D, Tuft S. Visual outcome following posterior capsule rupture during cataract surgery. Br J Ophthalmol 2001; 85:222-24.

69. Horiguchi M, Miyaki K, Ohta I, et al.Staining of the lens capsule in eyes with mature cataract. Arch Ophthalmol 1998; 116:535-37.

70. Thomas R. Role of small incision surgery in Indian scenario. Indian J Ophthalmol 2009 Jan-Feb; 57; 1:1-2.

71. Agarwal R. Wound construction in manual small incision surgery. Indian J Ophthalmol Jan-Feb 2010; 58; 1:85.

72. Blumenthol M. Small incision manual ECCE using hydro dissection. Ophthalmol Surg 1992; 10:699.

73. Gimbel, Neuhman. Development and methods of CCC technique. J Cataract Refract Surg 1990; 16:31.

74. Jaffe N S, Jaffe M S, Jaffe G F. Cataract surgery and its complications. Intraoperative complications Sixth edition;II:232-264.

75. Steinert's Cataract Surgery. Small incision cataract surgery in underdeveloped countries. Third edition.11:125-26.

76. Venkatesh R, Tan C S H, Singh G P, et al. Safety and efficacy of manual small incision cataract surgery for brunescent and black cataract. Eye 2009; 23:1155-57.

77. Steinert's cataract surgery. Control of astigmatism in the cataract patient. Third edition 24:289-302.

PROFORMA FOR DATA COLLECTION

S.No :

NAME: AGE/SEX: IP.NO:

ADDRESS: DOA: DOS:

DOD:

DIAGNOSIS OD OS

PREOPERATIVE EVALUATION:

BCVA		ANT SEGMENT		K READING				FUNDUS	
OD	OS	NS GR	IOP	K1	AXIS	K2	AXIS	OD	OS

IOL POWER:

INTRAOPERATIVE FINDINGS:

SURGEON NAME:

Incision size	Nucleus delivery difficulty	Cortical aspiration incomplete	Capsule tear	Vitreous disturbance	IOL position	Other procedure

POSTOPERATIVE EVALUATION: 1 ST DAY

1. UCVA -

OD	OS

2. ANTERIOR SEGMENT:

WOUND	CONJUCTIVA	CORNEA	AC	IRIS	PUPIL	IOL

POSTOPERATIVE EVALUATION: 1 WEEK

1. UCVA -

OD	OS

2. ANTERIOR SEGMENT:

WOUND	CONJUCTIVA	CORNEA	AC	IRIS	PUPIL	IOL

FUNDUS EVALUATION

<u>POSTOPERATIVE EVALUATION: 6 WEEKS</u>

1. BCVA -

OD	OS

2. ANTERIOR SEGMENT:

WOUND	CONJUCTIVA	CORNEA	AC	IRIS	PUPIL	IOL

3. K READING:

K1	AXIS	K2	AXIS

4. FUNDUS:

MEDIA	DISC	VESSELS	MACULA

5. RETINSCOPY

INFORMED CONSENT

I agree to undergo Temporal Manual Small incision Cataract Surgery in right/left eye under local anesthesia. I have been informed about the technique and complication of the surgery.

Date :

Place : Patient's name/ thumb impression

KEY TO MASTER CHART

F	–	f**e**male
M	–	male
RE	–	right eye
LE	–	left eye
SMC	–	senile mature cataract
SIMC	–	senile immature cataract
NS	–	nucleus sclerosis
UCVA	–	uncorrected visual acuity
BCVA	–	best corrected visual acuity
HM	–	hand movements
PL/PR	–	perception of light/ projection of light
Pre-op	–	preoperative
Post-op	–	post-operative
COMPL	–	complication
POD	–	post operative day
P-OP	–	post operative
DD	–	nucleus delivery difficulty
RD	–	nucleus rotation difficulty

NB/D	–	nucleus break and delivery
SPH	–	sphincterotomy
1°PCO	–	primary posterior capsular opacity
CE	–	corneal edema
SK	–	striate keratopathy
DF	–	Descemet membrane folds
DF-SP	–	Descemet membrane fold near the side port
IRP	–	irregular pupil
IRT	–	Iritis
PD	–	pigment deposition
K1	–	keratometry value in one principle axis
K2	–	keratometry value in another principle axis
AST	–	astigmatism
Pre-AST	–	preoperative astigmatism
Post-AST	–	postoperative astigmatism
WTR	–	with the rule astigmatism
ATR	–	against the rule astigmatism
OBL	–	oblique
CIA	-	change in corneal astigmatism
ARMD	–	age related macular degeneration

MASTER CHART

S.NO	IP NO	NAME	AGE	SEX	DIAGNOSIS	NS	BCVA	KERATOMETRY				INCISION	COMPL	DURATION	I POD		I WEEK P-OP		6 WEEK P-OP		KERATOMETRY				CORNEAL ASTIGMATISM				CIA	FUNDUS		PRE-OP AST	POST-OP AST
								K1	AXIS	K2	AXIS				UCVA	COMPL	UCVA	COMPL	BCVA	COMPL	K1	AXIS	K2	AXIS	PRE OP	AXIS	POST OP	AXIS	DIOPT	PRE OP	POST OP	TYPE	TYPE
1	8093	LANIAMM	70	F	RE SIMC	2	6/24	43.75	92	44.25	33	6.0	NIL	15	6/18	NIL	6/12	NIL	6/6	NIL	42.75	90	43.75	174	o.5	33	1.0	174	0.5	normal	normal	OBL	WTR
2	63525	IIRUMATHA	65	F	RE SIMC	4	PL/PR+	47.00	5	48.00	110	6.5	NIL	25	6/18	NIL	6/12	NIL	6/9	NIL	47.00	178	48.00	95	1.0	110	2.0	95	1.0	no view	normal	WTR	ATR
3	63511	LANIAMM	65	F	RE SMC	3	1/60	43.25	179	44.50	88	6.5	NIL	15	6/9	NIL	6/6P	NIL	6/6	NIL	43.75	167	45.50	92	1.25	88	1.75	92	0.5	hazy view	normal	WTR	ATR
4	63502	ANGASAM	60	M	RE SIMC	3	4/60	44.00	3	44.00	98	6.5	NIL	20	6/12	NIL	6/12	NIL	6/6	NIL	44.75	180	44.25	90	0.0		0.5	90	0.5	hazy view	normal	NIL	WTR
5	63512	VELAMMA	65	F	RE SIMC	2	6/36	43.75	173	44.75	85	6.0	NIL	20	6/9	NIL	6/6P	NIL	6/6	NIL	43.75	170	45.75	85	1.0	85	2.0	85	1.0	normal	normal	WTR	ATR
6	63424	IOTTAYAN	65	M	RE SMC	3	1/60	42.25	180	42.75	85	6.5	NIL	20	6/12	NIL	6/12	NIL	6/6	NIL	42.00	167	42.75	77	0.5	85	0.75	77	0.25	hazy view	normal	NIL	ATR
7	66512	VELAL	70	F	LE SMC	3	1/60	44.37	135	46.37	50	6.5	NIL	20	6/12	NIL	6/12	NIL	6/9	NIL	46.25	155	45.50	60	2.0	50	0.75	60	1.25	hazy view	normal	OBL	WTR
8	66511	RUMUGAN	60	M	RE SIMC	3	4/60	45.25	40	46.50	120	6.0	NIL	20	6/18	NIL	6/12	NIL	6/6P	NIL	44.75	54	45.50	130	1.25	120	0.75	130	0.50	hazy view	normal	OBL	OBL
9	66494	LLATHANG	62	F	LE SIMC	2	6/36	45.62	180	47.62	90	6.0	1°PCO	25	6/24	1°PCO	6/18	1°PCO	6/18	1°PCO	44.00	180	47.25	90	2.0	90	3.25	90	1.25	normal	normal	WTR	ATR
10	66491	NKITTAMM	50	F	LE SIMC	2	6/36	43.87	180	44.87	90	6.0	NIL	15	6/12	NIL	6/9	NIL	6/6	NIL	43.62	20	44.00	100	1.0	90	1.62	100	0.62	normal	normal	WTR	ATR
11	1791	IIRUMATHA	60	F	RE SIMC	3	3/60	47.50	97	49.75	7	6.0	NIL	20	6/24	SK	6/18	NIL	6/9	NIL	48.50	95	49.75	178	2.25	7	1.25	178	1.0	hazy view	normal	ATR	WTR
12	4356	MYLATHAL	61	F	RE SIMC	3	3/60	44.25	163	46.00	73	6.0	NIL	25	6/24	SK	6/18	NIL	6/9	NIL	44.75	180	46.75	85	1.75	73	2.0	85	0.25	hazy view	normal	WTR	ATR
13	4385	VELUSAMY	64	M	RE SMC	3	HM +	44.25	5	45.35	98	6.5	NIL	25	6/9	NIL	6/9	NIL	6/6	NIL	44.00	180	44.50	90	1.15	98	0.50	90	0.65	no view	normal	WTR	ATR
14	4394	MANIKAM	65	M	RE SMC	3	HM +	43.25	168	44.00	78	6.5	NIL	25	6/24	SK/CC	6/12	NIL	6/9	NIL	43.00	178	44.25	90	0.75	78	1.25	90	0.50	no view	normal	WTR	ATR
15	4363	MEENAKSH	60	F	LE SMC	3	1/60	44.75	87	45.75	177	6.5	NIL	25	6/24	NIL	6/12	NIL	6/9	NIL	44.50	95	47.25	184	1.0	177	2.75	184	1.75	hazy view	normal	ATR	WTR
16	4369	ANJAMMA	63	F	RESIMC	3	4/60	45.50	180	46.75	90	6.5	NIL	20	6/36	SK	6/18	NIL	6/9	NIL	45.00	180	46.75	94	1.25	90	1.75	94	0.50	normal	normal	WTR	ATR
17	4393	MARIMUTH	55	M	RE SMC	4	HM +	43.75	70	45.00	160	6.5	NIL	20	6/9	NIL	6/9	NIL	6/6	NIL	42.25	74	45.00	154	1.25	160	2.75	154	1.50	no view	normal	ATR	OBL
18	7236	LAKSHMI	60	F	RE SIMC	3	2/60	46.00	45	47.75	130	6.5	DD	30	1/60	CE/SK/DF	4/60	IRT/SK/DF	6/36	DF/CE	46.50	50	47.00	140	1.75	130	0.50	140	1.25	hazy view	hazy view	OBL	OBL
19	7240	TCHIAMM	62	F	RE SIMC	4	3/60	47.50	180	48.25	88	6.5	NIL	25	6/36	DF-SP	6/18	NIL	6/12	NIL	47.25	175	49.00	92	0.75	88	1.75	92	1.00	hazy view	normal	WTR	ATR
20	7043	RANGAMM	60	F	RE SIMC	3	4/60	45.25	10	46.50	95	6.5	NIL	20	6/12	DF-SP	6/12	DF/IRT	6/9	NIL	44.50	180	46.75	90	1.25	95	2.25	90	1.00	hazy view	normal	WTR	ATR
21	7238	HINNATHA	63	F	RE SMC	3	1/60	43.75	100	44.75	20	6.5	NIL	20	6/24	NIL	6/18	NIL	6/6	NIL	44.75	120	45.00	20	1.00	20	0.25	20	0.75	hazy view	normal	ATR	OBL
22	8610	ALANISAM	63	M	LE SIMC	3	6/60	44.75	100	46.75	20	6.5	NIL	20	6/6P	NIL	6/6	NIL	6/6	NIL	44.25	95	45.00	5	2.00	20	0.75	95	1.25	normal	normal	ATR	WTR
23	8587	AKSHMANA	60	M	LE SIMC	3	6/24	46.25	90	47.25	180	6.0	NIL	20	6/18	DF-SP	6/12	DF-SP	6/9	NIL	46.00	95	47.25	180	1.00	180	1.25	180	0.25	normal	normal	ATR	WTR
24	8696	RAJATHI	65	F	RE SMC	3	1/60	46.25	180	46.25	90	6.5	NIL	25	6/24	NIL	6/9	NIL	6/6	NIL	44.75	180	47.25	90	0.00		2.75	90	2.75	hazy view	normal	NIL	ATR
25	8694	ARIAYAMM	62	F	RE SIMC	3	6/60	46.50	175	47.75	90	6.0	NIL	20	6/12	NIL	6/12	NIL	6/6	NIL	47.25	180	47.00	90	1.25	90	0.25	90	1.00	normal	normal	WTR	WTR
26	9592	AYNA BEE	70	F	RE SMC	3	2/60	44.75	160	45.50	65	6.5	DD/SPH	30	6/36	SK/DF/IRP	6/24	SK/DF/IRP	6/18	IRP	44.50	180	46.00	90	0.75	67	1.50	90	0.75	hazy view	normal	OBL	ATR
27	11299	RUMUGAN	65	M	LE SMC	3	2/60	45.75	70	47.00	140	6.5	NIL	20	6/36	NIL	6/24	NIL	6/24	NIL	45.00	60	46.75	140	1.25	140	1.75	140	0.50	no view	ARMD	OBL	OBL
28	11310	SNANAKA	55	M	LE SIMC	3	5/60	42.75	100	44.00	20	6.0	NIL	15	6/18	NIL	6/12	NIL	6/6	NIL	42.75	90	44.50	180	1.25	20	1.75	180	0.50	normal	normal	ATR	WTR
29	11307	HINNAMA	38	F	RE SIMC	2	4/60	42.00	180	42.25	90	6.0	NIL	20	6/12	NIL	6/9	NIL	6/6	NIL	43.50	180	42.75	90	0.25	90	0.75	90	0.50	normal	normal	WTR	WTR
30	11319	RUPPASA	49	M	LE SMC	4	PL/PR+	44.37	103	45.37	15	6.5	NIL	20	6/36	SK/IRT	6/18	NIL	6/9	NIL	43.75	90	45.00	180	1.00	15	1.25	180	0.25	no view	normal	ATR	WTR
31	11319	RUPPASA	49	M	RE SMC	4	3/60	44.0	105	45.00	15	6.5	SPH	30	6/36	SK/DF	6/24	SK/DF-SP	6/9	IRP	44.00	110	45.50	30	1.00	15	1.50	30	0.50	hazy view	normal	ATR	OBL
32	11730	LALIAMMA	50	F	RE SIMC	2	6/60	45.50	5	46.00	95	6.0	NIL	20	6/24	SK/IRT	6/18	SK	6/12	NIL	45.50	180	46.75	90	0.50	95	1.25	90	0.75	normal	normal	WTR	ATR
33	11736	SAMUTHA	55	F	RE SMC	4	HM+	45.50	140	47.25	50	6.5	NIL	20	6/18	NIL	6/12	NIL	6/6	NIL	45.75	5	48.75	95	1.75	50	3.0	95	1.25	no view	normal	OBL	OBL
34	11728	KALAMANI	40	F	RE SIMC	3	4/60	48.75	165	49.75	75	6.5	NIL	15	6/9	NIL	6/9	NIL	6/6	NIL	48.25	20	49.50	110	1.00	75	1.25	110	0.25	normal	normal	WTR	OBL
35	11727	HINNATHA	65	F	LE SIMC	2	6/36	43.50	110	44.25	25	6.0	NIL	15	6/12	NIL	6/9	NIL	6/6	NIL	43.00	110	43.00	20	0.75	25	0.00		0.75	normal	normal	ATR	OBL
36	11307	HINNAMA	38	F	LE SIMC	3	3/60	43.00	100	43.00	7	6.0	NIL	20	6/12	NIL	6/9	NIL	6/6	NIL	43.00	90	43.75	180	0.00		0.75	180	0.75	normal	normal	OBL	WTR
37	11049	KRISHNAN	70	M	LE SMC	4	PL/PR+	44.50	180	46.00	90	6.5	RD/DD	30	3/60	CE/SK/SPH	6/60	CE/SK/PD	6/36	SK/PD	44.50	10	48.00	100	1.50	90	3.50	100	2.00	no view	hazy view	WTR	WTR
38	12368	RAKKIYA	68	F	LE SMC	4	PL/PR+	43.00	175	45.75	75	6.5	NIL	25	6/18	SK	6/12	NIL	6/12	NIL	43.00	175	46.25	80	2.75	75	3.25	80	0.50	no view	normal	WTR	ATR
39	12438	PAPPAL	80	F	LE SIMC	3	6/60	46.50	90	47.50	5	6.5	NIL	20	6/24	CE/SK	6/18	NIL	6/9	NIL	46.00	98	48.00	180	1.00	5	2.00	180	1.00	normal	normal	WTR	WTR
40	12339	SUSILA	55	F	RE SIMC	3	4/60	44.25	90	44.75	180	6.5	NIL	25	6/12	PD	6/9	PD	6/6	NIL	44.50	90	45.25	180	0.5	180	0.75	180	0.25	normal	normal	WTR	WTR

41	12344	SIVAKAMI	48	F	LE SMC	4	PL/PR+	43.00	175	44.00	80	6.5	1°PCO	20	6/12	1°PCO	6/12	1°PCO	6/12	1°PCO	43.50	175	44.00	80	1.0	80	0.50	80	0.50	no view	normal	WTR	ATR
42	12873	MEENAKSH	40	F	RE SMC	3	CFCF	46.50	180	47.75	90	6.5	NIL	20	6/12	NIL	6/12	NIL	6/9	NIL	46.50	180	48.00	90	1.25	90	1.50	90	0.25	no view	normal	WTR	ATR
43	12867	ARASWATH	57	F	RE SIMC	3	3/60	46.50	90	48.00	180	6.5	NIL	20	6/12	NIL	6/9	NIL	6/6	NIL	46.75	90	48.25	180	1.50	180	1.50	180	0.00	hazy view	normal	ATR	WTR
44	12868	RUKMANI	60	F	RE SIMC	3	5/60	44.50	180	45.50	75	6.0	NIL	20	6/9	NIL	6/6	NIL	6/6	NIL	45.50	170	45.00	75	1.0	75	0.50	75	0.50	normal	normal	WTR	WTR
45	12866	INNAKANN	60	F	RE SIMC	2	6/60	43.50	10	45.75	100	6.0	NIL	20	6/24	SK	6/36	IRT	6/9	NIL	44.25	20	45.50	110	2.25	100	1.25	110	1.00	no view	normal	WTR	ATR
46	12870	PALANI	40	M	RE SMC	4	PL/PR+	42.50	180	44.0	90	6.5	NIL	20	6/12	PD	6/12	PD	6/6	NIL	42.50	174	45.00	80	1.50	90	2.50	80	1.00	hazy view	normal	WTR	ATR
47	12872	MARIAMMA	60	F	RE SMC	3	1/60	46.00	180	47.00	90	6.5	NIL	20	6/12	SK/PD	6/12	NIL	6/12	NIL	46.00	170	47.25	80	1.00	90	1.25	90	0.25	normal	normal	WTR	ATR
48	12874	HINNAMM/	55	F	RE SMC	3	3/60	44.50	180	45.75	90	6.5	NIL	20	6/9	NIL	6/9	NIL	6/6	NIL	44.75	170	47.75	90	1.25	90	3.00	90	1.75	hazy view	normal	WTR	ATR
49	12869	VELATHAL	70	F	RE SMC	3	5/60	43.25	75	45.25	180	6.5	DD	25	6/24	NIL	6/12	NIL	6/6	NIL	44.00	75	46.75	175	2.00	180	2.75	175	0.75	normal	normal	ATR	WTR
50	14073	ANGAMMA	55	F	RE SIMC	3	2/60	42.50	180	43.00	90	6.5	DD	20	6/24	SK/PD/IRT	6/12	PD	6/6	NIL	43.00	170	43.50	80	0.50	90	0.50	80	0.00	normal	normal	WTR	ATR
51	13981	UDHACHA	70	M	RE SIMC	2	6/60	45.25	75	45.75	165	6.0	NIL	20	6/9	NIL	6/9	NIL	6/6	NIL	45.75	75	46.75	180	0.50	165	1.00	180	0.50	normal	normal	ATR	WTR
52	14078	AMMASI	60	M	RE SMC	3	PL /PR+	43.50	180	43.50	90	6.5	NIL	20	6/12	NIL	6/9	NIL	6/6	NIL	43.75	180	44.00	90	0.00		0.25	90	0.25	no view	normal	NIL	WTR
53	14424	LAKSHMI	70	F	LE SMC	3	HM+	43.50	180	44.50	90	6.5	NB/D	25	6/12	NIL	6/9	NIL	6/6	NIL	43.00	180	43.75	100	1.00	90	0.75	100	0.25	no view	normal	WTR	ATR
54	14030	PARVATHI	57	F	RE SIMC	2	6/60	44.75	95	46.00	170	6.0	NIL	20	6/9	PD	6/9	PD	6/6	NIL	44.00	100	45.75	170	1.25	170	1.75	170	0.50	normal	normal	ATR	WTR
55	14028	VELAMMA	60	F	RE SIMC	3	5/60	42.75	70	43.50	160	6.5	NIL	20	6/18	SK/IRT	6/12	NIL	6/6	NIL	42.00	70	45.00	170	0.75	160	3.00	170	2.25	normal	normal	ATR	WTR
56	13981	UDHACHA	70	M	LE SIMC	2	6/60	46.00	55	46.25	145	6.0	NIL	15	6/12	NIL	6/9	NIL	6/6	NIL	46.75	180	46.25	90	0.25	145	0.50	90	0.50	normal	normal	OBL	WTR
57	14252	AMMASI	75	M	LE SIMC	2	6/36	44.00	110	45.00	20	6.0	NIL	15	6/12	SK/IRT	6/9	NIL	6/6	NIL	43.00	90	42.50	180	1.00	20	0.50	180	0.50	normal	normal	ATR	ATR
58	14030	PARVATHI	57	F	LE SIMC	2	6/36	44.00	90	45.65	180	6.0	NIL	20	6/12	PD	6/9	PD	6/6	NIL	44.00	85	45.75	170	1.65	180	1.75	170	0.15	normal	normal	OBL	WTR
59	14479	AARON	45	M	LE SIMC	3	2/60	42.75	175	44.75	85	6.5	NIL	20	6/36	SK	6/24	NIL	6/6	NIL	43.25	170	45.50	90	2.00	85	2.25	90	0.25	normal	normal	WTR	ATR
60	26100	GANESAN	65	M	LE SIMC	3	2/60	42.75	90	43.00	180	6.5	NIL	20	6/60	SK/IRT	6/36	SK	6/18	NIL	43.25	90	44.25	175	0.25	180	1.00	175	0.75	hazy view	normal	ATR	WTR
61	26102	PIYARI	40	F	LE SMC	3	CFCF	45.50	110	46.25	10	6.5	NIL	20	6/24	SK/PD/IRT	6/24	SK/PD	6/18	PD	45.00	90	47.00	175	0.75	10	2.00	175	1.25	no view	normal	ATR	WTR
62	24111	NDHAKUM	56	M	RE SIMC	2	6/60	43.00	130	43.75	40	6.0	NIL	20	6/18	NIL	6/12	NIL	6/6	NIL	43.75	120	44.00	20	0.75	40	0.25	20	0.50	normal	normal	OBL	OBL
63	25617	ANDHAISA	75	M	RE SIMC	2	6/60	44.50	90	45.50	180	6.0	RD/DD/SPH	40	6/36	CE/SK/DF	6/24	CE/SK/DF	6/12	NIL	45.75	80	46.00	170	1.00	180	0.25	170	0.75	normal	normal	ATR	WTR
64	25703	SARASAL	50	F	LE SIMC	2	6/60	44.75	100	45.50	10	6.5	NIL	20	6/24	NIL	6/18	NIL	6/12	NIL	44.50	90	45.50	180	0.75	10	1.0	180	0.25	normal	normal	ATR	WTR
65	25698	ANNAMMA	65	F	LE SIMC	3	2/60	45.50	90	46.25	180	6.5	NIL	20	6/36	SK/IRT	6/24	SK	6/12	NIL	44.75	90	45.50	180	0.75	180	0.75	180	0.00	hazy view	normal	ATR	WTR
66	25698	JRUSAMM/	80	F	RE SIMC	3	6/36	44.75	180	45.75	75	6.0	NIL	20	6/18	NIL	6/12	NIL	6/6	NIL	43.75	180	45.00	90	1.00	75	1.25	90	0.25	normal	normal	WTR	WTR
67	26100	GANESAN	65	M	RE SIMC	3	6/60	43.00	90	44.00	180	6.5	NIL	20	6/12	NIL	6/9	NIL	6/6	NIL	43.00	90	44.50	180	1.00	180	1.50	180	0.50	normal	normal	ATR	WTR
68	25617	ANDHAISA	75	M	LE SIMC	3	6/60	44.00	90	45.00	180	6.5	NIL	25	6/18	SK	6/12	NIL	6/9	NIL	44.00	90	45.75	180	1.0	180	1.75	180	0.75	normal	normal	ATR	WTR
69	31760	LAKSHMI	64	F	RE SMC	3	5/60	45.00	90	43.75	180	6.5	RD	25	6/24	SK	6/12	NIL	6/6	NIL	45.25	90	43.50	180	1.25	90	1.75	180	0.50	normal	normal	WTR	ATR
70	31758	ARUMUGAM	60	M	LE SIMC	3	6/60	45.75	165	46.00	75	6.5	NIL	25	6/12	NIL	6/12	NIL	6/6	NIL	45.25	105	46.50	15	0.25	75	0.75	15	0.50	normal	normal	WTR	WTR
71	31761	ARAYIAMM	68	F	RE SIMC	3	5/60	44.25	180	45.35	85	6.5	NIL	25	6/12	NIL	6/9	NIL	6/6	NIL	44.75	180	45.25	90	1.10	85	0.50	90	0.60	normal	normal	WTR	ATR
72	34465	CHINNAN	57	M	RE SMC	4	1/60	48.75	160	49.75	70	6.5	NB/D	30	6/36	SK/DF	6/18	SK	6/12	NIL	47.75	20	50.50	120	1.00	70	2.25	120	1.25	hazy view	normal	WTR	OBL
73	34459	HUMAN BE	80	F	LE SIMC	3	6/60	43.75	80	44.75	180	6.5	NIL	25	6/24	SK	6/12	NIL	6/6	NIL	44.00	90	45.75	180	1.0	180	1.75	180	0.75	normal	normal	ATR	WTR
74	34462	ANNAMMA	60	F	LE SMC	3	3/60	45.50	90	46.75	180	6.5	RD	25	6/24	SK	6/12	NIL	6/6	NIL	45.75	90	47.25	180	1.25	180	1.50	180	0.25	hazy view	normal	ATR	WTR
75	34480	ANGASAM	58	M	LE SIMC	3	5/60	44.75	160	45.50	70	6.0	NIL	20	6/18	NIL	6/9	NIL	6/9	NIL	45.50	155	46.00	65	0.75	70	0.50	65	0.25	normal	normal	WTR	OBL
76	34504	VELATHAL	60	F	RE SIMC	2	6/60	45.25	10	46.75	100	6.0	NIL	20	6/18	SK	6/6	NIL	6/6	NIL	43.75	10	45.75	100	1.50	100	2.0	100	0.50	normal	normal	WTR	ATR
77	51289	MURUGESA	70	M	RE SIMC	3	6/36	43.75	180	44.25	90	6.5	NIL	25	6/18	NIL	6/12	NIL	6/6	NIL	42.25	180	44.75	90	0.50	90	2.50	90	2.00	normal	normal	WTR	ATR
78	51271	EERAMMA	60	F	LE SIMC	2	6/60	45.50	90	46.00	180	6.0	NIL	20	6/12	NIL	6/12	NIL	6/6	NIL	45.25	90	45.50	180	0.50	180	0.25	180	0.25	normal	normal	ATR	WTR
79	51272	MANANA	71	M	RE SMC	4	HM+	44.75	90	45.75	180	6.5	NB/D	25	6/24	CE/SK/DF	6/24	SK	6/12	NIL	44.75	90	45.00	180	1.00	180	0.25	180	0.75	no view	normal	ATR	WTR
80	66344	LANIAMM	60	F	LE SIMC	2	6/36	44.25	20	44.75	155	6.0	NIL	25	6/12	NIL	6/12	NIL	6/6	NIL	44.75	15	44.00	150	0.50	155	0.75	150	0.25	normal	normal	OBL	OBL
81	66340	PAPPATHY	53	F	RE SIMC	3	6/60	46.00	90	47.50	170	6.5	NIL	25	6/12	NIL	6/9	NIL	6/6	NIL	46.50	80	47.00	180	1.50	170	0.50	180	1.00	hazy view	normal	ATR	WTR
82	66361	NATARAJAI	64	M	RE SIMC	3	5/60	45.75	160	47.00	70	6.5	NIL	25	6/24	NIL	6/18	NIL	6/12	NIL	45.25	155	46.75	65	1.25	70	1.50	65	0.25	normal	normal	WTR	OBL
83	66350	ULASIAMM	60	F	RE SIMC	3	2/60	45.00	160	47.00	70	6.5	NIL	25	6/18	NIL	6/12	NIL	6/9	NIL	44.25	30	47.75	100	2.00	70	3.50	100	1.50	Hazy view	normal	WTR	OBL